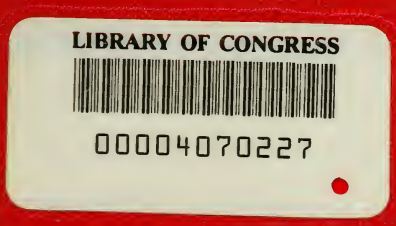

THE BUSINESS
OF
OIL PRODUCTION

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PREFACE

Several volumes on various phases of the petroleum industry have recently appeared. These have treated at length of the geology and technology of oil and gas. Only one, however, "The Economics of Petroleum," by J. E. Pogue, has undertaken a consideration of the important economic element. In this admirable work the author is more concerned with oil as a commodity than with the management of its production.

The present authors have recognized an immediate need on the part of many participating in the oil industry, especially the executives of oil companies, for a book on the business of oil and gas production. They have felt that the brief treatment of this subject in Johnson and Huntley's, "Principles of Oil and Gas Production" (1916) needs considerable expansion. A revision of the whole book, if the same scope were retained, would make a volume of unwieldy size, so great has been the advance in this field of knowledge in the few intervening years. Therefore, in view of increasing specialization, one or other of the authors will present such a revision from time to time, in separate volumes. The present book is the first of the series; the second will deal with valuation.

The authors wish to acknowledge the cooperation of Professor Charles Reitell, Professor of Accounting, University of Pittsburg, in the chapters on The Annual Report, Cost Accounting and Depreciation and Depletion; of Mr. Paul Ruedemann of the staff of Johnson, Huntley and Somers in the chapters on Taxation and Methods for Predicting Future Prices of Petroleum, and of Mr. H. A. Fisher and Mr. R. B. Bossler, the latter on the staff of the same firm, for cooperation in the chapter on The Extraction of Gasoline from Natural Gas.

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CHAPTER I

CHOICE OF REGIONS

The business of obtaining oil-producing land varies in method with the type of company doing the work. Companies may be classified as follows:

1. Old production companies seeking either to maintain production to offset the natural decline by the expenditure of depletion reserve, or else to increase their production by the expenditure of surplus earnings or new capital raised for the purpose.
2. Refineries having the same objects in view.
3. Newly formed companies desiring to build up an oil property.
4. Old companies exploring mostly through subsidiaries, in foreign fields.
5. Stock companies desiring production primarily as a basis for the sale of stock to the public.

(1) **Old Production Companies.** — An old company, with its files and with the information in the minds of its officers, has a great advantage over newcomers. Such a company is able to sit back and select its prospects from a wider range, and so avoid dangerous ones that might otherwise be undertaken. An old company, because of its knowledge of value and conditions, can act more quickly in case of success in any area within its district, and can buy acreage close to the successful well to better advantage than a new company.

Furthermore, in the case of an old company:

(*a*) Its greater efficiency in late development, resulting from its organization and experience, gives a wider margin of profit.

(*b*) It is better prepared to drill early and thus take advantage of the flush production of the pool.

(*c*) Additional leases can be handled without proportionate increase of expense.

Experienced oil men hold conflicting views as to the relative value of the following methods for older companies:

(*a*) Drilling wildcat wells in large blocks.
(*b*) Checkerboarding cheap acreage which is thought to have a good chance of advance, from the probable success of tests in the general region.
(*c*) Purchase of protection acreage near drilling wells.
(*d*) Purchase of " close-in " acreage for immediate drilling.
(*e*) Purchase of partly developed acreage.
(*f*) Purchase of fully developed producing lands.

Opinion is also divided as to the proportion in which appropriations should be made, in case various methods are combined.

Old conservative companies usually base their major operations upon (*d*) and (*e*). This is advisable because such companies are frequently closely related to pipe lines and refineries and must at all costs keep these running at full capacity. As they are often working at a profit, they more frequently have immediate cash accessible for such purposes. When well managed, they know the district intensively and so are better prepared to recognize good opportunities when presented, and to profit accordingly by money well spent.

A certain proportion of the depletion reserve may also be appropriated for drilling wildcat wells. The hazards are such that a company should either appropriate enough to make sure that, in the long run, the failures will be amply compensated by the successes, or stay out of this activity. The chance of success, while uncertain, is mainly dependent on the skill, experience and organization of the geological department; and the percentage of profit is so great in case of success that much attention should be given to the personnel of this department, and especially to the comity between it and the production department. Failure in such comity may nullify the efficiency of the department.

While the percentage of success in wildcat operations on geologically attractive structures in certain parts of Oklahoma is high, in other districts and in such states as Louisiana, Texas and Montana, it is much lower. Other factors than evidence of surface structure must therefore be considered before embarking in wildcat operations, and it is in the estimation of these factors that the most important errors are made.

In the period of activity through which Texas and Louisiana passed

in 1918 to 1920, even though geology was used as fully as possible, the percentage of successes was relatively low, partly because there were fewer outcrops to work from, and partly because success on some slightly indicated structures led to the wide testing of such prospects. Wildcatting was (and still is) carried on in some cases by old companies as the best means of expending profits otherwise liable to the present high income-tax rates.

In connection with more conservative operations, as in (*d*) and (*e*), the older companies also follow the second method of anticipating a boom in a certain district by buying scattered acreage at low prices, over wide areas. This was a noticeable feature in the development of Louisiana, following Homer. As geology is used more and more in the selection of leases, this checkerboarding method is hampered by the fact that geologically favorable acreage is taken up first, often by pioneers in the field, thus leaving only the less promising acreage at sufficiently low prices for the company desiring to checkerboard. Several large companies have been known to combine their efforts under one head and instruct the leaser to take alternate leases for each member of the group. The hope is that such companies will be represented by close-in acreage when any strike is made by wildcat operations. In this case, the company will usually supplement such holdings by additional purchases after announcement of a successful strike.

Taking " protection " acreage near wildcat wells drilled by other companies is also practical for certain groups. The sale of such acreage is often undertaken by small operators, as a means of partly or wholly financing the drilling. Sometimes they make a profit on such a venture even though the results are only dry holes; a notable case was the Carlyle Pool in Illinois. By this means the financing is divided among so many purchasers of leases that the aggregate of wells of this type might be said to be financed by the industry as a whole. Certain large companies can be depended upon to take protection acreage in any well being drilled by responsible men on an approved structure, while other companies still pay little or no attention to geology, and select such purchases mainly on their general confidence in the company conducting the venture.

The purchase of fully developed oil property does not offer sufficient speculative lure for the ordinary small company; but just because the number of purchasers is more restricted, it offers an attractive opportunity for large companies, provided sufficient attention is given to present and probable future fluctuations in the price of oil, to ensure buying in

time of depressed price. The estimates given by various operators of the value of an oil property vary very widely, unless the data are such as to permit the use of overworked and unreliable rules-of-thumb, in which case the variation will be less and the error still greater, because of unjustified confidence in such rules. The most widely used and most dangerous rule of this kind is to consider production of wells of nearly all sizes and over a very large area as being worth the same unit price per net barrel production.

No company should make a regular practice of purchasing developed properties without keeping one man well informed on modern appraisal methods, collecting data and calculating values, even if there is no property under option at the moment. In one general region the company should look to some one man as appraiser, whatever else may be his duties, and an analytical appraisal should be obtained from him before action is taken. This policy does not necessarily involve excessive detail if this man is given time to collect and have in mind much pertinent data ready for the day when action begins on a particular case.

A well-organized company with an aggressive policy will use a combination of all the methods mentioned above, distributing its efforts partly on the basis of the relative attractiveness of individual offerings which come to its attention, and partly upon its experience as to the relative success to be expected of each method in the territory in question. This requires a great deal of past experience and analytical capacity, as well as sound methods and a well-balanced judgment.

In recent years, cooperation by various companies has been practiced more than previously. This is desirable for small companies and for individuals, in that it lessens the burden of leasing expenses and divides the cost of drilling, which is becoming more expensive. Under the cooperative plan, the operations in one district will not exhaust the resources of any one company or individual. In case of success, there is often enough profit for each, and the uncertainty is shared.

(2) **Refineries Looking for Their Own Production.** — The refinery with no connections with a producing company, and with insufficient production under contract, is in danger of eventually being caught by unfavorable market fluctuations as between crude and refined products, and thus being forced out of business. Many so-called refineries are in reality only "topping" or "skimming" plants, producing only gasoline and fuel oil. They are active only temporarily at times of overproduction, buying crude oil at abnormally low prices, selling the

fuel oil as a by-product and looking to the gasoline for profit. They are efficient only during the period of flush production in any pool, when the oil is difficult to market, and they are properly forced out of business when competition for crude becomes keener.

The real refinery, on the other hand, represents a much larger investment per barrel of crude capacity, and should at all times control enough crude production to guarantee at least running expenses, even though the remaining amount is purchased in the market, or contracted for at short terms. As a partial alternative, the large refinery may, at times of over-production, and cheap prices, purchase and tank sufficient quantities of crude oil to run the plant for some years, or at least to supplement later purchases and keep down the average price paid per barrel for all crude. Such a policy very richly rewards those who have the necessary cash reserve available at such a time.

(3) **New Companies Building Up an Oil Property.** — New units of capital, desiring to lay a foundation for future operations in the oil business, must first satisfy themselves upon the following points:

(*a*) Whether or not an adequate amount of capital is available for preliminary operations, which must include, among other investigations, the making of geological and scouting reports upon various districts to determine relative desirability.

(*b*) What markets and pipe lines exist at present in the district, or may be expected in the future.

(*c*) In what districts the highest ultimate returns, for the money spent, can be expected.

(*d*) Whether, from their standpoint, immediate production on small acreage (involving smaller but more certain return on investment) will be more advisable than the laying of a broader foundation in more widely scattered holdings. The latter plan will postpone returns, necessitate more extensive preliminary ground work, and involve more patience on the part of the investing group. If carried out scientifically, however, it will usually result in higher ultimate returns where the capital is ample.

The best judgment on the part of experienced operators seems to indicate that the newcomer of more restricted resources should be prepared to follow the first plan, that is, to pay the necessary high prices and acquire small tracts of "close-in" acreage to producing acreage, and get at least some oil soon. This has the advantage that

it puts the new operators into the oil business at once, gives them an education in drilling and operating a property, and ties them down to one district. An intensive knowledge of one general area will result in the making of more money than a superficial knowledge of several areas, although some of these latter may really be better oil producers than the one settled upon.

(4) **Old Companies Exploring, Usually Through Subsidiaries in Foreign Fields.** — American oil companies have become increasingly interested, during the past few years, in the exploration and development of properties in foreign countries. Their methods have been conspicuous for lack of coordination and for faulty personnel. Their aim has usually been one of the following: (*a*) Desire to acquire properties to maintain the interest of their stockholders and directors, without further plans for the future except as opportunity or necessity presents itself; (*b*) Desire to have some attractive-appearing outlet for surplus earnings, by means of which high taxes may be avoided; (*c*) A well-laid plan to develop production to keep seaboard refineries running after the decline of domestic production, or (*d*) A basis of building seaboard refineries to supply foreign and maritime demand.

Needless to say, foreign operations require more initial capital than operations in the United States, and usually involve other forms of construction than merely drilling producing properties. This additional construction includes such items as railroads, pipe lines, river and sea terminals and tank farms, camp sites and warehouses; capital is also required for legal and lobbying organizations and for building or chartering tank steamers. None of these expenditures is involved in the operation of a strictly producing oil company in the home field, where the oil is taken at the wells by the pipe-line companies.

It may be said in general, therefore, that the smaller operator is eliminated in foreign operations, and the land controlled for development by a group entering a foreign field must be sufficiently large and promising to justify such major operations. The cooperation of small operators and wildcatters is lacking, and the whole burden and risk of prospecting, in addition to the construction work entailed after production has been obtained, usually falls upon the one company.

For this reason, second- and third-rate chances and small acreage are not attractive in foreign fields, except as an adjunct to the future development of the better class of lands. As a consequence, the first large companies represented in countries such as those in South America have a decided advantage over later comers.

Yet in some cases the preliminary prospecting has been done by relatively weak groups, who, after bringing in a few preliminary wells, sell out to stronger companies who are better prepared financially to carry on the work. Such sales are by no means always at a profit.

The fact that land is usually held in such countries in large blocks, and is acquired by denouncing government land, or by a direct concession from the government, furnishes additional factors which tend to exclude the small operators.

While the familiar " lease grafter " is always present, he deals in large units and includes politics in his operations, and his market is therefore correspondingly restricted.

In Mexico, the total effect is to discourage new capital from starting in the producing business, for the reason that production must be obtained before a pipe line can be justified. The time involved, first in drilling and then in building pipe lines and terminals, is so long, as compared with the total expectation of the life of certain pools, that these companies can only look forward to a few months' shipments before the pool is drained. The whole investment is then a loss, unless other production is secured, in which case it is necessary to lengthen the pipe line and provide new pumping stations and tankage, before the company can begin to pay back the capital invested. In Mexico, this necessitates the amortization, in large part, of all pipe lines and pumping stations during the short life of each pool, as well as the paying of all drilling and development and operating charges at the same time. It also involves a heavy land expense to keep up drilling reserve.

This is because, in the Tampico fields, there is no such thing as assured production for the periods usual in the oil business. When a pool begins to show salt water near its crest, a few months will see its complete abandonment. On the other hand, a company owning its own transportation system and assured of a market for its oil, can afford to wait until a new pool is drilled in, and even then can afford to buy enough " close-in " acreage to keep its line full during the life of the pool. A company which develops production with no pipe-line connections may be able to sell its oil at the well, during the first part of the development of the pool, to some company which may not at first be represented by acreage in that pool. As the latter company acquires drilling sites and gets its production, the first operator is cut off. In the same way, during the last part of the pool's life, certain pipe-line companies may see their wells go to water before the entire pool has done so, and hence be compelled to buy from independant producers, for a short period.

But, for the larger part of the pool's producing period, the independent operator, with a well on his hands and no pipe line, is at the mercy of the larger companies, and his best plan would be to sell out at the best price obtainable.

(5) **Stock Companies Desiring Production Primarily as a Basis for the Sale of Stock to the Public.** — During certain periods of active stock-market speculation, there springs up a class of operators whose aim is to supply the demand for stock issues which combine the elements of possible high yield with good news value, through association with some spectacular oil field then under development.

For the purpose of these operators the connection of the stock offered with real production may be only slight, but it must be real. Therefore, it was a common practice in certain pools, especially during 1918–1919, for such a speculator to buy a small tract close to some large producing well, and drill on it. It made little difference to his plan that the price paid per acre was several times the value of any reasonable quantity of oil which could be expected to exist beneath such a tract, even though it might be in the richest part of the pool. The profit lay in selling stock to a certain element of the public.

If a sufficient number of such speculators enter a field, such as the Burkburnett pool, they bid up the price for acreage to a point where the legitimate operator cannot compete. In addition, parts of the field are cut up into plots which amount to mere "drilling locations." There is no uniformity of drilling or operating methods; wells are ruined by amateurish and sometimes intentionally vicious methods of drilling; bad records are kept, and the entire industry suffers, both directly, through less oil being produced eventually, and indirectly by the bad morale introduced into the industry as a whole. The legitimate operator may find an attractive field for investment in the later life of such a pool, after it has lost its interest to its owners and they are willing to sell it cheaply. Wells can be cleaned out or new ones drilled and finished properly, and while a one-acre property could not be operated profitably after the decline had well set in, a group of such properties adjacent to one another can sometimes be handled at a profit when bought cheaply. By this time, of course, the original speculator has wandered to other pastures.

These speculators profit mainly by turning in properties for stock which can be sold in excess of its value, by receiving excessive salaries for the quality of services rendered and by extraordinarily heavy commission and bonuses.

They are nevertheless able to accomplish their sales, largely because the public is ignorant of the rate of decline and of the costs of production. Their method is to concentrate the buyer's attention on the revenue from a newly completed well; their activities are therefore usually limited to a field with at least one spectacularly large well. The case of Calgary was an exceptional one, in which the extraordinary quality of the oil was made to supply the deficiency in size.

In summarizing the foregoing it should be said that a company should not enter a field, at home or abroad, without first being fully informed not only as to its oil possibilities but also as to its physical, economic and political conditions, and, further, as to the ability of the company to adapt its own personnel and plans to these conditions.

CHOICE OF STRUCTURE

Attempts have been made to determine a factor representing the expectation of success for wells drilled upon structure, as compared with " wildcats " drilled with no geological evidence in their favor. Such a factor is of doubtful value, because of the danger of too great generalization in the mind of the company executive who wishes to know, for instance, how large an appropriation to set aside for such purpose, in order that he may be reasonably assured of success within the limits he sets himself. The ratio varies in each of the sands in each of the major fields, and a ratio worked out can only be a composite of these. It could therefore be used only by a company which could afford to spread its prospecting over the entire area from which the data are drawn. The average company, however, is restricted to one, two, or three fields, in which the structures may vary so much from the type structure, in certain essentials as to render valueless any general factor. In the case of such variations, the individual characteristics of the prospect must be the determining features. In other words, even in one region, there are structures and " structures."

The choice of structure for exploration should involve a consideration of the following conditions:

1. Stratigraphic section.
2. Evidence of porosity of sands.
3. Closeness to production.
4. Thickness and number of sands.
5. Proximity to mountain folding.
6. Faulting.
7. Size of structure at closing contour and height above it.

8. Evidence of steeper or less steep folding with depth.
9. Evidence of unconformities or convergence from other causes, between shallow and deep formations.
10. Steepness of dip as compared with other oil-producing structures in the same field.
11. Possible gathering area.
12. Depth of sands.

As most structures are not productive under the entire fold, it frequently happens that the first wells are not successful. There is therefore an advantage in the simultaneous drilling of a series of holes by various companies, provided one is well protected with acreage on various parts of the structure of the supposed field. In this case, each of the companies gets the advantage of the combined expenditures of all. Thus, when wells are deep and expensive, simultaneous drilling is a desirable feature from the standpoint of a company searching for leases on structures to be drilled.

The ideal stratigraphic section consists of thick beds of shale alternating with relatively thinner, well-bedded porous sands. The shales should be, at least in part, somewhat carbonaceous in character. Beds of relatively dark bituminous shale or slate are more desirable than those of light or bright-colored shales with a correspondingly smaller amount of buried organic matter.

The thickness and number of sands underlying a structure are factors which add to its attractiveness. Each additional sand, particularly if known to be oil-bearing elsewhere, gives one more chance of success in drilling. While the thickness of such oil-bearing sand is not in direct ratio to its reservoir content and productivity, nevertheless there is usually a noticeable increase with thickness, at least up to 80 feet.

The section, however, must not be too sandy, as that condition would destroy the tendency of oil to concentrate in certain beds in commercial quantities. Besides, the excess sand takes up the place which should be occupied by the shale source beds in an ideal stratigraphic column.

A structure under which there is known to be only one possible pay horizon of perhaps 10 feet in thickness, at a depth of 3500 feet, is not so attractive as one containing a number of shallow sands of from 30 to 50 feet in thickness. However, the deeper pay sand territory will presumably not be drilled so closely by small operators, and the original

operator in a section may get a larger proportion of the flush production of a pool. If it is operated wisely there will be less gas lost, and probably a greater total proportion of the oil recovered with ewer wells than in the shallow territory.

Owing to the effects of heat and pressure, in large part manifested by mountain folding, as one approaches the steep folds toward the mountains the reservoirs in the folds are found to be filled with gas, with little or no oil. On coming still nearer to the mountains, one finds greater cementation or secondary crystallization and no commercial gas. This condition is noticeable to a greater degree in the deeper sands, and may be measured by the coal rank, expressed as

$$\frac{\text{fixed carbon}}{\text{fixed carbon plus volatile matter}}$$

in any coal that may be present.

A dome or anticline may be faulted so that the oil has leaked from one side of the fault and has been retained on the other, or migration may have been arrested at the fault. This is a condition of frequent occurrence in the California fields. Frequently the structure on one side of the fault is productive, while it contains salt water on the other.

The size of the structure above the lowest closing contour, both vertically and laterally, is a rough measure of its comparative value as a potential oil-producer, inasmuch as this volume is at the same time a measure of the possible volume of the oil reservoir above the water table. However, considerations of reservoir shape introduce a large error.

Some fields are characterized by "folds" of differential sagging; that is, later sediments laid down on an already folded or irregular sea floor, as they compact, will sag away from preëxistent ridges or high spots. These folds include those in which the major movement took place early in the sedimentation and continued with interruptions to a lesser degree in the periods coincident with the deposition of the more recent sediments. Thus, the dip in the deeply buried beds is much steeper than in those at the surface.

The crests of structures mapped at the surface do not always correspond with the crest underground. A study of developed structures in the same field may show general features of sufficient similarity, so as to be of value to the prospector about to drill a wildcat structure in the region. For the same reason, the steeper dips in the lower sands

may give a producing area which is more restricted laterally than would be expected from mapping the surface beds.

Some of the producing fields in the so-called Wilcox sand in Oklahoma are only slightly indicated at the surface. However, as much of this area has been drilled over in the shallower sands, and as the inclination increases in degree with depth, some of the structures are mapped by a study of well logs of the shallower sands.

The degree of dip on untested structure should be compared with the dips of producing structures in nearby pools of the same fields. It is possible in some cases that folding in the older rocks in fields has so opened the crest through jointing as to permit partial loss of contents of the reservoir.

SIGNIFICANCE OF DRY HOLES

The significance of dry holes is modified by the following considerations:

1. Whether or not the holes were drilled on favorable structure.
2. Whether or not a small amount of oil was found. A small quantity, while not practical for further development at prevailing prices and conditions at the time of drilling, is sometimes adequate for later development.
3. Whether the holes were drilled deep enough to test all known sands.
4. Whether they were properly drilled and handled. In a region developed with the rotary drill, this is a question which can often be answered in the negative.
5. Whether, with increased prices of oil and better pipe-line facilities, or as the shallower sands become exhausted, it might not become advisable to test deeper sands which underlie the region. Sometimes one company controls enough well-placed acreage to justify the entire expenditure for such a deep test, which should always be located in the most favorable location in the pool from a structural standpoint, without reference to shallow dry holes. A common error, in making a deep test, is to wait until some hole is dry in the shallow sand and continue drilling it through to the deep sand, instead of choosing the best location. This blunder is all too common and has been made by organizations that should have known better. Some of the deepest and most expensive dry holes are of this sort. The location of deeper tests should receive much more

consideration and study than the location of ordinary pioneer wells.

Sometimes the acreage is so split up among various companies as to make it appear more just that, while one company may do the drilling, in case of a dry hole the cost should be prorated. This is done by making what are known as " dry-hole contributions " on the part of the companies interested: in the event of success the drilling company pays all costs, but in the case of failure the cost is prorated on a previously agreed basis.

Again, these tests of deeper sands are often made on acreage lying on structure which has been condemned or abandoned in the shallow sands, just before the leases are surrendered, in order to make sure that such a course is warranted. Such a test may even be made " off structure " to decide whether or not to surrender a large block of leases where the annual cost of rentals is burdensome. The determining feature in such a decision is too frequently merely financial, and there is no adequate study from a wide enough basis of data, as to the probability of success of such a venture.

6. Where very strong unconformities are known or supposed to exist in deeper formations, particularly if there is faulting in the deep sands, a dry hole may be drilled within a few hundred feet of the reservoir without giving any indication of oil. A careful study of the logs of several such wells may give a clue to underground conditions, and lead to the location of the pool. This frequently happens in the Red Beds of southern Oklahoma.
7. By plotting the elevations of key horizons found in the series of dry holes, it is sometimes possible to discover a general tendency of the deep formations to rise in certain directions. Such clues have frequently led to the discovery of productive pools of oil, lying on the crests of domes not showing in the surface formations.

GRAPHIC COMPARISON OF FIELDS

A company, before deciding to invest money in one field rather than another, should not only consider the cost of acreage, but should make a fundamental comparison of the fields under consideration, preferably by graphic methods, covering the following points:

1. Number of producing sands.
2. Thickness and porosity of " pays."
3. Acreage yields.
4. Decline curves of individual wells and properties.
5. Number of acres drained per well.
6. Chance for deeper sands.
7. Quantity and quality of oil.
8. Price curve in relation to lifting charges and operating costs.
9. Competition between refineries and pipe lines for oil from that field, now and in the future. In other words, the probable market conditions.
10. Predicted future price curve.

CHAPTER II

CLASSES OF HOLDINGS

Oil and gas rights may be obtained by either the operator or the investor in the following ways:

1. Purchase in fee of the land under which lie the deposits of oil or gas.
2. Purchase of the oil and gas rights of the land.
3. Purchase of the mineral rights.
4. Lease of the oil and gas rights.
5. Purchase of the royalty interest.
6. Assignment of rights from a previous holder.

(1) **Purchase of the Land.** — If land is very cheap, the right to any oil or gas deposit underlying it may be obtained by purchase in fee of the surface, as well as the underground rights. With such a holding the owner avoids all question of damages to crops, pollution of springs, etc., and also possible conflict with the workers of other mineral products. If land is remote from oil and gas production and not of especial value for farming or other purposes, it may sometimes be obtained more cheaply by purchase in fee than by lease or purchase of the oil rights. The mere suggestion of oil immediately intoxicates certain types of landowners with visions of wealth and leisure, so that they are prone to set a higher value upon their property and demand a higher bonus or royalty from a lease than the producer can give. Conditions sometimes arise, as has been the case in Mexico, where on account of unsuitable leasing laws, it is advisable to buy the land outright, even at a high cost.

On the other hand, agricultural land is generally too costly for purchase in fee. Sometimes the desire of the farmer to participate in the chances of the venture make it unwise to bid high enough to obtain the land in fee, as the lease itself is proportionately so much cheaper.

There are probably comparatively few cases in which conditions are so favorable that purchase in fee is advisable, though in such cases the method is very advantageous. The purchase is sometimes made after production is well developed and the entire surface of the lease has been used for operations.

(2) **Purchase of the Oil and Gas Rights Alone.** — This method, though rarely used, is advantageous, because the holding is more secure than a lease and because the purchaser is not hurried into drilling prematurely, as he might be in order to fulfil the obligations of a lease. Its principal disadvantages are that it is not so well known or understood, and hence is more difficult to arrange. Here also, as above, the landowner's desire to participate in the chances of the venture frequently make the lease relatively cheaper.

(3) **Purchase of the Mineral Rights of the Land.** — This method is simply an extension of the principle involved in the previous one, the rights to all minerals being included. It would make certain the avoidance of friction with the workers of any other minerals, and would have the advantage of concealing the hope of oil, where this hope might increase the difficulty of obtaining rights from the landowner. It would not be advantageous to the oil producer where the minerals, other than oil, were of any considerable value. In some states, Louisiana for example, mineral rights expire automatically unless the land has been proved by development.

(4) **Lease of the Oil and Gas Rights.** — This is the most common method and therefore the easiest. Its greatest advantage is that the operator or investor acquires, and therefore pays for, only such rights as he wishes. It does not require an outlay for valuable agricultural land, nor the purchase of other minerals, if such happen to be present. A lease merely permits the extraction of the oil and gas from the ground and makes such arrangements for use of the surface as are necessary to facilitate the operation. Furthermore, a lease, by providing for payment in the form of a royalty instead of a sum of money to be paid whether or not oil is found, relieves the operator of some of the inevitable risk, and at the same time does not burden him in case oil is discovered. As a lease is usually obtained for a cash bonus, which varies within wide limits, and a promise to drill, a minimum expenditure is required at first. Finally, a lease, if properly written, can be readily surrendered if the property is proved by neighboring drilling to be worthless.

One disadvantage in the lease lies in the uncertain legal standing of some of its provisions. Such matters are, however, gradually becoming settled by modifications of the lease-form to satisfy the courts, and little trouble should be experienced with an up-to-date lease. Some consideration must be given to the terms of old leases when these are acquired by assignment. Another disadvantage is that drilling is

often required before market and transportation conditions warrant it. This is aggravated by the fact that the landowner is usually very desirous of having a well on his land at an early date and often refuses to grant a lease except on these terms. However, this disadvantage is becoming somewhat lessened by the increasing demand for petroleum.

A lease may be given by an individual, by an association of individuals, by a corporation or by a Federal or State Government. While the Oil Land Leasing Act of February 25, 1920, provides a permit form for exploring the public lands of the United States, the real holding that follows a discovery is in the form of a lease. In foreign countries the rights obtained from individuals or the grants received from governments are of similar nature.

(5) **Purchase of the Royalty Interest.** — That interest in the oil development which the landowner or lessor retains in the form of royalty may be transferred; and purchase of royalty in whole or in part is often made, either by companies or individuals. The purchase of one-half the royalty is most frequent.

If the land is undeveloped, the purchaser of royalty shares the same risk, proportional to the expense, that is borne by the lessee of the land, although the former is assured a definite percentage of production if wells are successful, regardless of operating expense and difficulty. If the land is producing, the royalty interest is assured a return, being a definite percentage of the property's output. In estimating the value of such a royalty however, due consideration must be given to the future normal decline of production. This is so commonly underestimated that values of royalties are frequently greatly inflated where the wells are large.

(6) **Assignment of Rights from a Previous Holder.** — The laws relating to oil and gas permit assignment of fee, mineral rights, royalty interests or leases, all of which may therefore be obtained not only from the original proprietor but, for a consideration, from any later holder. A great deal of oil is, in fact, produced on such assigned leases. Whereas a lease is most commonly taken originally on undeveloped property, by the time of its assignment the property may be partly developed, wholly drilled and proved, undrilled but made highly promising by neighboring wells or by the possibility of deeper untested sands, or otherwise affected by conditions which modify its value and attractiveness, frequently increasing its value greatly.

CHAPTER III

THE LEASE, FORM AND PROVISIONS[1]

Fundamental Characteristics of Oil and Gas. — Oil and gas possess peculiarities of occurrence which have considerable bearing upon their possession and development. Chief among these is the capacity, or tendency, to flow underground toward a well or wells, regardless of property lines at the surface. It was therefore decided, early in the history of oil and gas production, that the title to oil and gas does not belong to any private owner until they are reduced to actual possession by means of wells drilled on surface property that is owned or leased for the purpose.

An historic decision by the Supreme Court of Pennsylvania compares them to wild animals. It states that " Water and oil, and still more strongly gas, may be classed by themselves, if the analogy be not too fanciful, as minerals *ferae naturae*. In common with animals, and unlike other minerals, they have the power and tendency to escape without the volition of the owner. Their 'fugitive and wandering existence within the limits of a particular tract is uncertain.' They belong to the owner of the land and are part of it and are subject to his control; but when they escape and go into other land, or come under

[1] For the legal status and considerations of leases, the reader is referred especially to the following:

Thornton, W. W., The Law of Oil and Gas, 3rd Edition, 1918. W. H. Anderson Co., Cincinnati.

Morrison and DeSoto, Oil and Gas Rights, 1st Edition, 1920. Bender-Moss Co., San Francisco.

Rice and Lyons, The Oil Operator in Oklahoma, 1st Edition, 1919.

Shamel, C. H., Mining, Mineral and Geological Law, 1907. Hill Publishing Company, New York.

Veasey, J. A., Struggle of the Oil Industry for the Sanctity of its Basic Contract, 1920. Privately printed, Tulsa, Okla.

U S. Bureau of Mines, U. S. Mining Statutes Annotated: U. S. Bureau of Mines Bulletin 94, 1915, Parts I and II.

U. S. Bureau of Mines, Abstracts of Current Decisions on Mines and Mining by J. W. Thompson: Published from time to time as bulletins for free distribution.

another's control, the title of the former owner is gone. Possession of the land, therefore, is not necessarily possession of the gas. If an adjoining or even a distant owner drills his own land, and taps your gas, so that it comes into his well and under his control, it is no longer yours, but his."

This applies to oil as well as to gas. The uncertainty of the existence of oil or gas has been largely responsible for the use of the lease. In the majority of cases the owners of the land have been farmers, who could not afford to raise the money necessary for drilling, without more definite prospects of success. At the same time few producers were willing to risk buying the farm, if it had value as farm land, for the sake of oil or gas whose presence was not at all certain. Thus it came about that the farmer gave the producer a permit or lease to test his land, at a small first consideration, and accepted his reward in the form of a royalty if oil or gas were discovered.

Lease Provisions. — For the transfer of title to oil or gas by means of leasing, a form has been developed which includes the following general provisions:

1. Cash consideration
2. Duration of lease.
3. Description of leased territory.
4. Oil royalty.
5. Gas rental or royalty.
6. Drilling requirements.
7. Rental in lieu of drilling.
8. Protection to landowner against damage to crops, buildings, etc.
9. Right to surrender lease upon failure to commence drilling well or to make rental payments.

The lease is signed by the lessor, by his wife, if he is married, and generally by the lessee. It must be acknowledged or sworn before a notary or other authorized person, and is finally filed and recorded at the office of the county clerk.

Producer's Lease Form. — The lease form most widely used in 1921 is called the " Producer's 88." It is an evolution of past leases embodying a treatment of the general provisions that have been proved best by past experience. It is as follows:

[1] W. W. Thornton, The Law of Oil and Gas, Vol. I, page 43.

OIL AND GAS LEASE

AGREEMENT, Made and entered into the.....day of.....19...
by and between.....
.....
of.....party of the first part, hereinafter called lessor (whether one or more) and.....party of the second part, hereinafter called lessee.
WITNESSETH, That the said lessor, for and in consideration of.....DOLLARS, cash in hand paid, receipt of which is hereby acknowledged and of the covenants and agreements hereinafter contained on the part of lessee to be paid, kept and performed, has granted, demised, leased and let and by these presents does grant, demise, lease and let unto the said lessee, for the sole and only purpose of mining and operating for oil and gas, and laying pipe lines, and building tanks, powers, stations and structures thereon to produce, save and take care of said products, all that certain tract of land situate in the County of.....State of.. Oklahoma, described as follows, to-wit:

.....
.....
.....
.....
.....

of Section.....Township.....Range.....and containing..
.....acres, more or less.

It is agreed that this lease shall remain in force for a term of.....years from this date, and as long thereafter as oil or gas, or either of them, is produced from said land by the lessee.

In consideration of the premises the said lessee covenants and agrees:

1st. To deliver to the credit of lessor, free of cost, in the pipe line to which he may connect his wells, the equal one-eighth part of all oil produced and saved from the leased premises.

2d. To pay the lessor..... DOLLARS each year in advance, for the gas from each well where gas only is found, while the same is being used off the premises, and lessor to have gas free of cost from any such well for all stoves and all inside lights in the principal dwelling house on said land during the same time by making his own connections with the wells at his own risk and expense.

3d. To pay lessor for gas produced from any oil well and used off the premises at the rate of.....DOLLARS per year, for the time during which gas shall be used, said payments to be made three months in advance.

If no well be commenced on said land on or before the.....day of.....
.....19.....this lease shall terminate as to both parties, unless the lessee on or

before that date shall pay or tender to the lessor, or to the lessor's credit, in the.... .....Bank at..... or its successors, which shall continue as the depository regardless of changes in the ownership of said land, the sum of.....DOLLARS, which shall operate as a rental and cover the privilege of deferring the commencement of a well for.....months from said date. In like manner and upon like payment or tenders the commencement of a well may be further deferred for like period of the same number of months successively. And it is understood and agreed that the consideration first recited herein, the down payment, covers not only the privileges granted to the date when said first rental is payable as aforesaid, but also the lessee's option of extending that period aforesaid, and any and all other rights conferred.

Should the first well drilled on the above described land be a dry hole, then and in that event, if a second well is not commenced on said land within twelve months from the expiration of the last rental period which rental has been paid, this lease shall terminate as to both parties, unless the lessee on or before the expiration of said twelve months shall resume the payment of rentals in the same amount and in the same manner as hereinafter provided. And it is agreed that upon the resumption of the payment of rentals, as above provided that the last preceding paragraph hereof, governing the payment of rentals and the effect thereof, shall continue in force just as though there had been no interruption in the rental payments.

If said lessor owns a less interest in the above described land than the entire and undivided fee simple estate therein, then the royalties and rentals herein provided shall be paid the lessor only in the proportion which his interests bears to the whole and undivided fee.

Lessee shall have the right to use, free of cost, gas, oil and water produced on said land for its operations thereon, except water from wells of lessor.

When requested by lessor, lessee shall bury its pipe lines below plow depth.

No well shall be drilled nearer than 200 feet to the house or barn now on said premises, without the written consent of the lessor.

Lessee shall pay for damages caused by its operations to growing crops on said land.

Lessee shall have the right at any time to remove all machinery and fixtures placed on said premises, including the right to draw and remove casing.

If the estate of either party hereto is assigned, and the privilege of assigning in whole or in part is expressly allowed—the covenants hereof shall extend to their heirs, executors, administrators, successors or assigns, but no change in the ownership of the land or assignment of rentals or royalties shall be binding on the lessee until the lessee has been furnished with a written transfer or assignment or a true copy thereof; and it is hereby agreed that in the event this lease shall be assigned as to a part or as to parts of the above described lands and the assignee or assigns of such part or parts shall fail or make default in the payment of the proportionate part of the rents due from him or them, such default shall not operate to defeat or affect this lease in so far as it covers a part or parts of said lands upon which the said lessee or any assignee thereof shall make due payment of said rental.

Lessor hereby warrants and agrees to defend the title to the lands herein described, and agrees that the lessee shall have the right at any time to redeem for lessor, by payment, any mortgages, taxes or other liens on the above described lands, in the

event of default of payment by lessor, and be subrogated to the rights of the holder thereof.

.....

.....

.....

In Testimony Whereof We Sign, this the.....day of.....19....

Witness: .....(*Seal*)

....(*Seal*)

....(*Seal*)

....(*Seal*)

The " Producer's 88 " for Oklahoma may be analyzed as follows:

(1) **Cash Consideration.** — This may be merely a nominal consideration of one dollar, or a bonus of greater amount, proportionate to the value of the leased tract.

The one dollar consideration was originally inserted for the purpose of fulfilling the legal requirement that a contract have mutuality. It has since been decided in some courts that where the lease contains a binding covenant of any sort, such as a duty to pay rent or royalty, or to drill a well, which practically all leases do contain, there is no need of this nominal consideration. Nevertheless, it is usually given, largely from custom perhaps, but also as prima facie evidence that the lease is not unilateral. In Louisiana a lease is hardly secure, even with a nominal consideration, until rental has been paid, or a well started.

A bonus is a premium, usually expressed as an amount per acre, paid for the privilege of the lease, where the value of the land seems to warrant it. A bonus may be anything from a few cents to more than a thousand dollars per acre and in general depends on the proximity to production.

Values of undrilled tracts are judged principally on the idea that the nearer a property lies to producing wells, the greater is its chance of becoming a producer. At the same time, acreage which is obviously more favorably situated from a geological standpoint will, of course, command a higher bonus than that which is " off structure " or otherwise inferior, even though in the same neighborhood. The influence of this factor upon value varies with other geological conditions and with the extent to which geological considerations influence the buyer.

(2) **Duration of Lease.** — In new leases in inactive territory, the time allowed for the completion of a well may be extended, by delay

rentals, to ten years; but in older leases it is usually limited to five-years. In actively producing regions this time may be greatly shortened. Whatever the term stated, the lease nearly always provides " or as long thereafter as oil or gas is produced therefrom in paying quantities."

(3) **Description of Leased Territory.** — This must be carefully given, for the law declares that if the tract cannot be located from the description without arbitrary discretion, or without resort to parol evidence, the description is not sufficient.

The description by township, range, and section of acreage surveyed under the public land system of the United States is definite enough to avoid danger of confusion, except that irregular fractions must be described with great care. In the eastern part of this country, a farm is usually described by naming the farms which bound it on all sides. Where this may be ambiguous, metes and bounds are used.

(4) **Oil Royalty.** — The most common royalty is one-eighth, or $12\frac{1}{2}$ per cent, and it may be paid either in oil or in cash, according to stated agreement. Other royalties, such as one-tenth, one-seventh, one-sixth, one-fifth, one-fourth and one-third, are sometimes given, although one-tenth is seldom seen except in old leases. The leases on the Osage Indian Reservation in Oklahoma call for one-sixth royalty on most wells.

Where a royalty greater than one-eighth is given, it generally results in a reduction of bonus, or takes the place of bonus, for in practice the various forms of remuneration tend to supplant one another. It is generally considered among producers, however, that one-fifth, or 20 per cent, is the maximum royalty that should be paid for a lease, as depletion so soon reduces a well to a point where a higher royalty would force abandonment or a new lease at reduced royalty.

In most cases royalty is fixed; that is, the rate established at the beginning is continued unchanged throughout the life of the wells. But production decreases with age, and in the course of time the seven-eighths remaining to the lessee may become so small as to render the wells unprofitable, even though a small amount of oil might still be produced for a long time. The life of such wells might be prolonged by means of a royalty which would decrease when the production of the well became too low for profitable operation at the old rate. This would benefit both the lessor and the lessee, and work in the interest of conservation. Royalties of this type have been called " sliding royalties."

An example of sliding royalty may be found in the Oil Land Leasing Act, where two schedules are used, one calling for higher royalty from wells producing lighter oil of more than 30° Baumé gravity, and a lower one for the heavier oils under 30° Baumé. Graduations are based upon productions in barrels per day, and in the preference lease following a permit, are as follows:

(1) **For Oil Above 30° Bé.**

			Per cent
Wells producing	up to 20	bbls. per day,	$12\frac{1}{2}$ or $\frac{1}{8}$ royalty.
"	20 " 50	"	$16\frac{2}{3}$ " $\frac{1}{6}$ "
"	50 " 100	"	20 " $\frac{1}{5}$ "
"	100 " 200	"	25 " $\frac{1}{4}$ "
"	over 200	"	33 " $\frac{1}{3}$ "

(2) **For Oil Below 30° Bé.**

			Per cent
Wells producing	up to 20	bbls. per day,	$12\frac{1}{2}$ or $\frac{1}{8}$ royalty.
"	20 " 50	"	$14\frac{2}{7}$ " $\frac{1}{7}$ "
"	50 " 100	"	$16\frac{2}{3}$ " $\frac{1}{6}$ "
"	100 " 200	"	20 " $\frac{1}{5}$ "
"	over 200	"	25 " $\frac{1}{4}$ "

While it is not usually possible to make a two-fold classification on the basis of gravity of the oil, a graduation such as this, which decreases the royalty as the production decreases, is fundamentally correct, even though the percentages listed above are too high for some fields. In spite of these obvious advantages, sliding royalties are not as yet often used.

A sounder method of sliding royalties has been proposed by the senior author[1], based on an exemption from all royalty or a very low royalty on a certain fixed amount of the well's production, the oil above that amount being subject to the agreed rate. This method reduces the royalty regularly instead of by jumps, and hence avoids friction and disputes as to the exact time of the jump.

(5) **Gas Rental or Royalty.** — The lessee generally pays an annual rental for a successful gas well, where the gas is used off the premises. This rental may be $100 or $150, or even more if gas is much in demand. Rental may also be paid for gas from an oil well, where that gas is in sufficient amount to be sold off the lease.

[1] Johnson, Roswell H., Sliding Royalties for Oil and Gas Wells: Trans. Am. Inst. Min. Eng., Vol. 52, pp. 322–328.

A gas royalty is not used very often, on account of the expense of metering. However, it may be used where gas lands are in great demand, as in the McKeesport boom, or where the depletion is so rapid as to lead the producer to believe that the fixed rental may not be warranted up to the end of the year, while the gas is valuable enough to justify the production of even small amounts from the well. Difficulties are met with in the measurement of gas, and leases which provide for a royalty on gas specify in considerable detail the method of measurement to be employed. Where a royalty is used, a sliding royalty is desirable for gas as well as for oil.

Due to the recent importance of the manufacture of gasoline from natural gas, leases should make provision for gas used for this purpose.

It is customary to ignore the quality of gas in the lease, but a very few leases or lease drafts have had reference to helium or to the number of thermal units in the gas.

(6) **Drilling Requirements.** — Most leases require that a well be drilled, although delay in the commencement of the well is usually permitted upon the payment of rentals, usually quarterly, sometimes annually. The drilling requirement is liable to be made stricter in a partially developed region than in wildcat country, by increasing the delay rental and the frequency with which it must be paid.

The lease often specifies that a certain depth must be reached. This is because the landowner desires a test of some well-known sand, such as the Bartlesville of Oklahoma, the Marble Falls of Texas, or the Woodbine of Louisiana, and demands a depth which promises to go through this horizon. Such a clause, however, generally permits a well to stop at shallower depth if paying quantities of oil or gas are found. The lease may, however, demand that sooner or later a well must go down to the deeper horizon. In place of the depth requirement, a lease may state that a certain sand must be tested, which works out well if there is no question about the identity of this sand, but leads to dispute if there is any uncertainty. Occasionally a lease requires that the well reach a well known horizon known to underlie the sand, in order to avoid uncertainty, as Oklahoma leases formerly demanded that a well go to the Mississippi Lime, which is below the Bartlesville sand.

Where the lease requires that drilling operations shall commence within a certain time, or before a certain date, the bringing of lumber on to the premises, for the purpose of building a derrick, is good compliance, the starting of actual drilling within the time not being essential.

A common requirement is that the well must be completed, subject to unavoidable delays.

Diligence of operation is necessary, however, and a covenant to commence drilling within a fixed period is not performed by starting work and then indefinitely suspending it. The law also holds that neither lessor nor lessee can be made the arbiter of the extent to which, or the diligence with which, the operations shall proceed, but that both shall be governed by the standard of what is reasonable. No obligation rests on the lessee to carry the operations to a point where they would be unprofitable to him, even if some benefit to the lessor would result therefrom.

There is an implied covenant on the part of the lessee that he will put down enough wells to protect the leased premises from being drained by wells on adjacent territory, and such protection may rightly be demanded by the lessor. He cannot rightfully demand, however, that every " offsetting well " be met, if they are far too numerous for sound economy.

(7) **Rental in Lieu of Drilling.** — At the present time, most leases give the operator the option of drilling or paying delay rentals. One dollar per acre per year, payable quarterly, is quite common.

(8) **Protection to Landowner.** — The landowner retains the right to the surface, except in so far as part of it may be needed by the lessee for operating purposes; and the lease protects the lessor from undue damage to crops or buildings. In an 80-acre tract, not more than 5 or 6 acres are usually necessary for operation.

Land in the oil fields is not often valuable enough to impose restrictions upon the lessee; but where it is, he stands damages to growing crops, etc. Pipe lines can be buried below plow depth, but pull rods for pumping are sometimes a source of trouble to the farmer, because they are above the surface, or generally very near the surface if buried.

(9) **Right to Surrender Lease.** — The right of the lessee to surrender a lease that is obviously of no further value is sometimes definitely expressed and sometimes implied by rental and drilling clauses. Although a surrender clause so worded that the lessee can drop the lease at will has been the cause of uncertainty and legal contention, nevertheless, the right of surrender itself has been generally supported by the courts. The uncertainty of the existence of oil or gas makes it entirely just that the lessee should have the right to surrender a lease when it

is shown by tests in the vicinity that oil and gas are not likely to be present. The " Producer's 88 " lease, is so worded that the lease does not run beyond the date set for a well, unless extended by a rental, a form which avoids many of the objections to the early surrender clauses.

In many leases the surrender is not automatic but must be brought about by a notice of surrender sent to the lessor, an objectionable feature because needlessly troublesome. The right of surrender, however, does not give the lessor the corresponding right to cancel the lease at will, since the lessee must have a definite security of status to warrant him in laying his plans for development.

Signing of the Lease. — The lease is signed by the lessor, whether one or more. The lessee does not have to sign the lease to make it binding, since his acceptance is sufficient. As a matter of fact, however, he usually does sign it and it is better that he should.

If a man alone is a lessor, it is best to sign as " John Doe, Single " or " John Doe, Widower," so that there can be no necessity for inquiring why a wife did not join him. A wife should join her husband in the lease of his lands, for if she does not do so, upon his death she may assert her marital rights to the detriment of an existing lease given by the husband alone. In case of a homestead, those states which require the wife's signature to make a transfer of a homestead, also require the same to make an oil and gas lease valid.

Acknowledgment of Lease. — A lease must be sworn to, although some states are stricter than others in confining the acknowledgment right to certain details of wording that are not universally required. In Texas, for example, leases must include in the acknowledgment a statement that it was executed for the purposes and " consideration" therein expressed.

The acknowledgment is one of those portions of the lease concerning which specific state laws should be carefully ascertained. In the Appendix, acknowledgment forms for several states are given.

Filing and Recording the Lease. — A lease should sooner or later be filed and recorded at the office of the county clerk. Filing and recording may be postponed indefinitely if it is the desire of the lessee to keep secret the fact that leasing is going on. This may however, lead to trouble, for if a lease is not recorded the lessor may lease again, and the second lease is good if recorded first and if it can be shown that the second lessee did not know of the first lease. The first lessee

can only recover by means of criminal action against the lessor; and the difficulties of this action, together with that of proving that the second lessee was not aware of the first lease, are so great that a compromise is usually resorted to in place of legal action.

Assignment. — The lease form sometimes has added to it a blank for the first assignment of a lease.

CHAPTER IV

TECHNIQUE OF LEASING

Since much more of the earth's surface is utilized as farm land than is covered by cities, towns, and villages, it follows that most of our oil and gas pools are found in farming or ranch country. This is especially true because few fields happen to have been found in thickly settled parts, such as New England, New York, and eastern Pennsylvania. It is the farmer, therefore, with whom the leaser has to deal in the great majority of cases.

The leaser generally finds the farmer in the producing counties more or less versed in the business of oil and gas production and often with pronounced ideas as to the terms to be proposed, especially in respect to early development. On the other hand, in non-producing counties, the farmers often know nothing of the business or of lease forms and readily sign the form offered, so eager are they to encourage the oil man. At the same time, the leaser, acting for the lessee, has in mind a definite limit appropriate to the attractiveness of the acreage. Hence, while a lease is sometimes secured easily, in other cases a compromise may be necessary, or it may even be impossible for the parties concerned to come to any agreement whatever. In fact, it is not often that an operator succeeds in leasing all the tracts in an area. Some farms are sure to be left for any succeeding operator who will offer better terms, and in rare instances a few farms will remain unleased until the development of a field is in full progress.

Leasing may be done by:

1. Members of the land department of a company, either regular employees or leasers employed for the occasion.
2. Members of other departments who assume this additional work on occasions.
3. Independent leasers who will later market their leases with operators.

The larger companies have land departments, and leasing is altogether in the hands of employees of these departments.

In the smaller companies it may fall to members of other departments,

such as scouts or geologists, to do the leasing or help with it when a leasing campaign is in force. The geologist is especially likely to be called on to lease or work with leasers, as he is better able to give quick decisions on the proper territory to acquire or the relative desirability of offerings. On the other hand, the geologist may have less ability in getting leases, because he has had less experience, and because the technical or engineering viewpoint is so different from that of the trader or land man that both viewpoints are seldom highly developed in one individual. Furthermore, his efforts to lease, following his geologic examination, may lead the farmers to believe that the land is very promising, and thus cause them to ask high premiums for it.

An independent leaser may be a broker or speculator, or he may have an understanding with a company to procure certain blocks of leases and later assign them at a fixed price — at a commission or for payment by the day. He is often an inhabitant of the region being leased, and therefore especially well acquainted with the people themselves, the extent of their property, and their customs. When this is not the case, such a man is frequently employed as notary and assistant. A local bank of relative prominence and repute is of the greatest assistance to the oil man in acquiring his leases, as well as in developing them, and the operator does well to make himself known there at an early stage.

Brokers and speculators make every effort to get into new territory ahead of the companies and are so active that it is generally necessary for operators who want to take up a block of leases for a test to acquire a certain amount of acreage from them. In spite of the fact that they may be very capable leasers, and that they save the companies the expense of putting in so many of their own men, they are nevertheless of very doubtful service, or even an obstacle to the actual producer of oil or gas. This is because the independent leaser is seldom a true broker, who buys and sells for a commission profit, but is usually a speculator as well, getting leases for little or nothing, as the companies might have done if they had tried in time, and holding them at the highest price the market will bear. The speculator's profit, then, is far greater than the cost of leasing would be to the operator if the leaser chose an area of increasing demand. He, of course, has his losses when he has erred in the choice of acreage.

On the other hand, companies often employ local agents to get acreage for them. The agent may take these leases in his own name, concealing or not concealing the name of the company, as conditions

demand. The greatest advantage of this method is that the company can thus utilize the familiarity of the agent with the people and their customs. This advantage is even more important in foreign fields than in this country. The leases can readily be assigned to the company, provided the honesty of the agent is above suspicion. The agent method is convenient also where any individual or group, less familiar with oil production than the regular companies, desires leases in some chosen locality.

The leaser is able to offer the landowner the following considerations to induce him to lease:

1. A bonus.
2. Rental until oil is produced.
3. A percentage or royalty of the oil marketed.
4. A gas-well rental or gas royalty.
5. A test well.

(1) *Bonus.* — Since the bonus depends largely on the distance from production, the lease man generally makes the farmer a fairly definite offer, dependent upon obvious conditions. In purely wildcat territory this offer is not often refused, even though it is very small, but where the prospects for production seem bright, the bonus may have to be settled by considerable bargaining. The farmer who asks a large bonus is likely to have the viewpoint that he is unwilling to accept the hazards of the business, and prefers his return at once, leaving the operator free to do as he pleases, once the lease is given. Another class of landowners, however, may be anxious to share the risks, and to receive the smaller bonus, provided royalty and test-well provisions are made more favorable.

Competition among the oil men often results in high bonuses. Company leasers make great efforts to obtain a block of leases without the knowledge of other companies, but are not always successful. It so happens, therefore, that a second lessee will raise the whole level of bonuses by offering more than the first company in order to obtain an acreage in the block. Such acreage is valuable because the development plans of the original producer give the second one a test without expense.

(2) *Rental.* — The owner generally accepts the amount of rental which is standard for the neighborhood. Delay rental is likely to be of more concern to the company than to the lessor, since the aggregate acreage held in reserve calls for an annual payment that may easily

FIG. 1. ANNUAL INCOME OF ONE-EIGHTH ROYALTY AT VARIOUS PRICES OF OIL FOR VARIOUS AVERAGE DAILY PRODUCTION. (CENTS DROPPED)

Daily Production bbl.	1	5	10	15	20	25	50	100	500	1,000	5,000	10,000
Price												
$1.50	$ 68	342	684	1,026	1,460	1,710	3,421	6,843	34,218	68,437	342,187	684,375
1.75	79	399	798	1,197	1,688	1,996	3,992	7,984	39,921	79,843	399,218	798,437
2.00	91	456	912	1,368	1,825	2,281	4,562	9,125	45,625	91,250	456,250	912,500
2.25	102	513	1,026	1,539	2,053	2,566	5,132	10,265	51,328	102,656	513,281	1,026,562
2.50	114	570	1,140	1,710	2,281	2,851	5,703	11,406	57,031	114,062	570,312	1,140,625
2.75	125	627	1,254	1,882	2,509	3,136	6,273	12,546	62,734	125,468	627,343	1,254,687
3.00	136	684	1,368	2,053	2,737	3,421	6,843	13,687	68,437	136,875	684,375	1,368,750
3.25	148	741	1,482	2,224	2,965	3,707	7,414	14,828	74,140	148,281	741,406	1,482,812
3.50	159	798	1,598	2,395	3,193	3,992	7,984	15,968	79,843	159,687	798,437	1,596,875
3.75	171	855	1,710	2,566	3,421	4,277	8,554	17,109	85,546	171,093	855,468	1,710,937
4.00	182	912	1,825	2,737	3,650	4,562	9,125	18,250	91,250	182,500	912,500	1,825,000
4.25	193	969	1,393	2,908	3,878	4,847	9,695	19,390	96,953	193,906	969,531	1,939,062
4.50	205	1,026	2,053	3,079	4,106	5,132	10,265	20,531	102,656	205,312	1,026,562	2,053,125
4.75	216	1,083	2,167	3,250	4,334	5,417	10,835	21,671	108,359	216,718	1,083,593	2,167,187
5.00	228	1,140	2,281	3,421	4,562	5,703	11,406	22,812	114,062	228,125	1,140,625	2,281,250
5.25	239	1,197	2,395	3,592	4,790	5,988	11,976	23,953	119,765	239,531	1,197,656	2,395,312
5.50	250	1,254	2,509	3,764	5,018	6,273	12,546	25,093	125,468	250,937	1,254,687	2,509,375
5.75	262	1,311	2,623	3,935	5,246	6,558	13,117	26,234	131,171	262,343	1,311,718	2,623,437
6.00	273	1,368	2,737	4,106	5,475	6,843	13,687	27,375	136,875	273,750	1,368,750	2,737,500
6.25	285	1,425	2.851	4,277	5,703	7,128	14,257	28,515	142,578	285,156	1,425,781	2,851,562

grow to large proportions. The burden of paying rentals exercises a powerful influence upon the amount of acreage which a company can carry undeveloped from year to year.

(3) *Royalty.* — One-eighth is standard royalty, but in rare cases the lessor may demand more, even at the sacrifice of his bonus. A royalty of 50 per cent, with no bonus, had to be paid for one lease in the Cushing pool of Oklahoma. With any royalty, but more particularly with a royalty higher than one-eighth, the farmer will find it to his advantage to agree to a reduction when the well approaches exhaustion; but such later bargaining can well be avoided by means of a sliding royalty. In areas far from production, a one-tenth royalty is still sometimes obtained, but there is a tendency to give one-eighth and extend the time allowed for starting a well or have a lower delay rental stipulated in the lease.

(4) *Gas rental or royalty.* — There is not much variation in this clause, the leaser merely finding it necessary to offer a larger gas rental where only gas is expected, or where the gas is in strong demand. Gas royalty is common only where the wells are quite small or under the excitement of a boom, as at McKeesport.

(5) *Test well.* — A test well is the most urgent demand of many farmers; and this is very natural where there has been little bonus and they must look to the royalty for their return. They feel that their farms should be tested in earnest rather than become a mere object of speculation to others. Furthermore, the great return derived from royalties, where the wells are large, is an attractive prospect. Many leases can be obtained through the promise of a test where no other consideration will satisfy. The leaser will do well to show the prospective lessor such a table as the following (Fig. 1), showing the income for a year from a variety of prices of crude oil and of yields of oil. The popular underestimate of the rapidity of decline of wells works to the interest of the leaser.

On the other hand, the leaser cannot afford to grant many wells without the option of paying delay rental in lieu of drilling. If the leases are being taken for speculation, enough time must be allowed for their profitable transfer; at the same time, a purchaser does not want to buy leases with drilling requirements that would be a hardship. If the leases are taken by a company, there must frequently be a delay, since the company may have already planned a program of drilling to the limit of its capacity, or, in times of depression, its production may already be as great as it can market.

A well is therefore a very attractive consideration to the landowner, but a difficult one for the lessee to grant. Mutual agreement is always hastened by any proposition from the latter looking toward a reasonable development of the neighborhood as a whole.

The leaser may also emphasize any of the lesser provisions, such as protection to buildings and crops, gas for domestic use, etc., provided they seem to appeal to the individual.

CHAPTER V

OIL AND GAS RIGHTS ON FEDERAL AND STATE LANDS

RIGHTS OBTAINED THROUGH THE PLACER LAW

Origin and Application of the Placer Law. — The provisions of the Placer Law had their origin in the code of rules formulated by the gold miners of California and Nevada in 1849 and the years immediately following. This code was made Federal Law by the Acts of 1870 and 1872, which were then incorporated into the Revised Statutes, and are the mining laws of the present day. The Placer Law applies only to the public lands of the United States.

It was many years after the discovery of petroleum and the establishment of the Placer Law, before the jurisdiction of this law was definitely extended to oil and gas rights on the public lands. This was mainly because the public lands were chiefly in the western part of the country where the oil and gas possibilities were not recognized at first. As late as 1896, although the location of some petroleum lands had been made under the Placer Law, there was considerable doubt of its application, and the legal propriety of such a location had not been definitely decided. The first location of this kind seems to have been that of March 22, 1880, for mineral entry No. 18, Los Angeles District, California. The decision was made finally, however, by Congress in the act of February 11, 1897, (29 Stat. 526), in which it is provided: " that any person authorized to enter lands under the mining laws of the United States, may enter and obtain patent to land containing petroleum or other mineral oils and chiefly valuable therefor, under provisions of the laws relating to placer mineral claims." This act definitely put the patenting of oil lands under the Placer Law, in spite of the fact that this law, based on practices that had grown up in gold mining, was wholly unsuited to the characteristics of oil and gas pools. To make oil and gas lands subject to such a law was a legislative blunder, of which confusion, uncertainty, litigation, bad feeling and even violence were the natural results.

Provisions of the Placer Law. — The provisions of the Placer Law may be stated briefly as follows:

(1) *Location.* — A qualified claimant must "locate" the tract of land of which he desires possession, and after he has made his choice of location, it must be "distinctly marked on the ground so that its boundaries can be readily traced." (Revised Statutes 2324.) Further local and state laws may require, in various ways, a posted notice and the recording of the application and location with a specified district or county officer.

A valid location gives the locator "Exclusive right of possession and enjoyment of all the surface included within the lines" of the claim. (Revised Statutes 2322.)

(2) *Discovery.* — A qualified person, however, may not lay claim to a tract of public land until he has made a discovery of mineral thereon. A location must be based on a discovery.

In the case of a placer deposit of gold, platinum or other similar mineral, a discovery is easily made and seldom requires more than a hand-dug trench a few feet deep. In the case of petroleum, however, surface evidences were not accepted, and discovery had to be made by a well sunk to a horizon which would ultimately produce commercially, whether a hundred feet or several thousand feet below the surface. As to the amount of oil necessary to constitute a discovery, one Wyoming State Court decision held that the discovery need only be such as to warrant a reasonably prudent man in continuing work. The Land Office, on the other hand, persistently asked for something more nearly approaching a true commercial discovery.

(3) *Size of claim.* — The claim may comprise 20 acres if located by an individual, or if made by an association, 20 acres for each member thereof; but in no case may it exceed 160 acres. Since even 160 acres is too small in practice, no 20-acre claims were taken, except under extraordinary circumstances. There is no limit to the number of claims which may be located by a single individual or association, although, if more than one, they must not be adjacent. A device by which a party of nine men take adjacent claims, by dropping one name in rotation, has been common and is apparently accepted by the Land Office.

(4) *Assessment work.* — After having made a valid location, and being thus entitled to the exclusive right of development, the claimant must expend not less than $100 worth of labor or improvements upon the claim during each year. The claimant has until the end of the calendar year succeeding his location, in which to perform his first assessment work, and thereafter the calendar year is the period for which such work is required.

(5) *Patent.* — After not less than $500 worth of labor and improvements has been put into the claim, and proof of discovery made, the claimant may obtain patent on payment to the government of $2.50 an acre, and upon fulfilling certain requirements as to posted notices, publication and survey of claim, etc. This gives the claimant the full title in fee to the land.

Inapplicability of Placer Law to Oil and Gas Deposits. — In the application of the Placer Law to oil and gas claims, a great difficulty arose in the operation of the discovery provision. A period of possession is necessary in an oil claim prior to discovery, since a discovery of oil has to be made by means of a drilled well. But the law does not provide the claimant with any period of possession until a discovery has been made. In the difficulties arising over this requirement, the courts attempted to give a sort of protection, but it was extremely vague. It seems to have been agreed that a claimant could not be ousted by force or fraud from his possession prior to discovery, but that an adverse claimant might enter the land peaceably, in good faith and in compliance with the law, and also proceed to make discovery on the same tract. The courts, however, did not define the extent to which a prior occupant might go to prevent a peaceable and open entry, which might result finally in a prior discovery, with the result of displacing the one who first started operations. This uncertainty of possession caused many troubles for those who claimed oil lands under the Placer Law, and furthermore discouraged many others who might have initiated claims.

The feature of the Placer Law which most seriously unfitted it for application to oil was the amount of land to a claim, namely, 160 acres. This is quite inadequate to offer the necessary reward for the heavy expenses and risk of pioneer wildcatting. The result was that real tests were not made as the law contemplated, but one of two subterfuges was resorted to; either more than one claim was obtained by indirection, or else cheap, shallow wells, sometimes referred to derisively as " post holes," were put down to get a mere " rainbow " of oil from the shales in order to warrant affidavits that oil had been " discovered."

A second weakness of the law was that had its spirit had been actually carried out, so that the new pioneer field was cut up into separate operating units of 160 acres each, these could not be economically operated because of the many duplicated organizations in the district and the failure to pool information.

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WITHDRAWAL OF PUBLIC LANDS FROM LOCATION

Purpose and History. — The only way to correct the objectionable features of the Placer Law in its application to petroleum lands was to suspend the operation of the law. It was not feasible to let things go on until Congress could pass a law, because of the long time such a process would require, as demonstrated by the ten and one-half years (1909 to 1920) that it took Congress to pass the present law. This suspension of operation was therefore effected by withdrawing from petroleum location all public lands which gave promise of production.

At the same time, the necessity of an oil-fuel supply for the navy became evident, and the withdrawal of possible producing territory had for its second purpose the assurance of this supply in the future.

Sources of Specific Information on Withdrawals. — The United States Geological Survey published during 1916 a bulletin numbered 623, by Max Ball, entitled "Petroleum Withdrawals and Restorations Affecting the Public Domain." This bulletin gives all withdrawals and restorations in detail to January 15, 1916. The states of Arizona, California, Colorado, Louisiana, Montana, North Dakota, Utah and Wyoming are included; the areas affected are shown on maps accompanying the bulletin, and are also described by section, township and range.

Appendix A of Bulletin 623 gives withdrawals and restorations from January 16 to September 30, 1916. From that time until the passage of the Act of February 25, 1920, the United States Geological Survey put this information before the public in the form of mimeograph sheets, issued whenever necessary.

FEDERAL OIL AND GAS ACT OF FEBRUARY 25, 1920

The Leasing Act of February 25, 1920, formally put an end to withdrawals for the purpose of conservation and better regulation, while providing for possible future withdrawals for naval use. It likewise restored all withdrawn lands, except those for naval reserves, and for such other special uses as are noted in the bill.

In a sense, the withdrawals have been replaced by proclamations to the effect that certain lands lie within the structure of a producing oil or gas field, and are therefore subject to lease, but not to an exploring permit.

In general, the Act provides for exploration, under a prospecting permit, of withdrawn lands which are not on a structure producing

oil or gas, and for the final development, under a lease holding, of withdrawn lands on the same geologic structure with production.

The area covered by a permit consists of a maximum of 2560 acres, that is, 4 sections of 640 acres each. It is obtained by making application to the proper district land office, where the application is held for thirty days to enable conflicting claims to be presented, and then forwarded to the Commissioner of the General Land Office for final decision and award. Tenure is two years in the States and four years in Alaska, with correspondingly easier drilling requirements in the latter territory. Permits are issued not only on lands wholly unclaimed, but also on claims staked under the Placer Law, where no valid discovery has been made.

The greatest weakness of the law is the priority privilege, by which one placing a notice on the land has thirty days in which to make application, during which time he has priority rights. This leaves the door wide open to perjury as to the time the stake was set. In other words, the lease belongs to the one first complying with a regulation under conditions which make it impossible for the government to check the accuracy and reliability of the statements made; whereas the decision might be made to depend upon the time of filing at a government office, which can be known with accuracy and surety. It is to be hoped that this defect will yet be remedied.

Leases are of several kinds, as follows:

(1) *Lease following permit.* — The discovery of oil or gas in an area prospected under a permit, entitles the holder to a lease of one-quarter of the area of the permit for twenty years, with ten-year extensions, at a 5 per cent royalty (no royalty for the first five years in Alaska).

(2) *Preference lease following permit.* — The successful permittee also has a preference right to a lease on the remainder of his permit, at sliding royalties fixed by the Secretary of the Interior.

(3) *Lease at auction.* — Unappropriated or withheld acreage within the known geologic structures of producing oil and gas fields are offered at occasional auctions in blocks not exceeding 640 acres. Only one auction has so far been held. Bidding was strong and high prices were realized. Unfortunately, the Government has issued no bulletin showing just what lands are so classified or withdrawn from permit application, and such a bulletin is necessary for a proper operation of the law. Specific royalties are set for each lease, and the award is made to the bidder offering the highest bonus. Boundaries of producing struc-

tures are determined by the United States Geological Survey, and maps and files showing them are placed on file in the local land offices.

(4) *Placer lease.* — Where a tract has been developed under certain specified conditions under the Placer Law, but no patent has been issued, the holding may be converted into a lease under this act. Where all the conditions requisite for patenting have been complied with, and the Government is so convinced, the owner will, of course, prefer to take a patent.

An outline of the Act of February 25, 1920, is given in Fig. 2.

The text is printed in full in Appendix A, together with the regulations for the operation of this act, and a digest of decisions and opinions in connection with its administration.

STATE LANDS

Lands owned by the States themselves are in many cases open for oil and gas development. The following are states, of interest to the oil and gas producer, in which the conditions of prospecting and development can be specifically stated.

Ohio. — The Auditor of the State has the authority to lease " any unsold portions of Section 16 and Section 29, or other lands granted in lieu thereof, of the original surveyed townships for the support of schools and religion "[1] upon such terms as may seem best. Furthermore, by the laws of 1916, the mineral rights are reserved to the State on all public lands sold after that date.

Louisiana. — The state lands are of considerable extent, and include lakes and river beds. Application for any tract should be made to the Governor of the State, who is authorized thereupon to call for further bids up to an announced date, at which time award is made to the highest bidder. The award is in the form of a lease at not less than one-eighth royalty, or $200 a year for each gas well.

Oklahoma. — There are several hundred thousand acres of school lands scattered throughout western Oklahoma. These are offered from time to time at public sale, the bidder offering the highest cash bonus being awarded a lease at one-eighth royalty. Unless a well is completed within a year, an annual rental of $1 per acre is required until such drilling is done. A lease runs for five years, and as long thereafter as oil or gas may be produced thereon in paying quantities.

All lands between mean high-water mark in streams or rivers 2 chains or over in width, are owned by the State, and may be leased by the

[1] Ohio General Statutes, Sec. 3209.

Nature of Holding	Lands to which Applicable	Acreage Limits	Number Allowed	Duration	Rental	Drilling Requirements	Royalties	Other Costs	Miscellaneous
Permit To prospect undeveloped and	Not within the geologic struc-	2560 acres.	3 in same state. 1 on same geo-	2 years. Extensions subject to	———	I. Commence drilling within	20 per cent of value of oil or gas produced. Per cent To 20 bbls. per day, $12\frac{1}{2}$	———	$1000 bond to insure proper op-

Nature of Holding	Lands to which Applicable	Acreage Limits	Number Allowed	Duration	Rental	Drilling Requirements	Royalties	Other Costs	Miscellaneous
Permit To prospect undeveloped and unclaimed lands.	Not within the geologic structure of a producing oil or gas field in the U.S.	2560 acres.	3 in same state. 1 on same geologic structure.	2 years. Extensions subject to permission of secretary of interior.	———	I. Commence drilling within 6 months. II. Drill 500 feet in one year unless oil or gas found at less. III. Drill 2000 feet in 2 years unless oil or gas found at less.	20 per cent of value of oil or gas produced.	———	$1000 bond to insure proper operation. Assignable on consent of Secretary of Interior.
	In Alaska.	2560 acres.	5, but only one on same geologic structure.	4 years. No extensions.	———	I. Commence drilling within 2 years. II. Drill 500 feet in 3 years unless oil or gas found at less. III. Drill 2000 feet in 4 years unless oil or gas found at less.	20 per cent of value of oil or gas produced.	———	Same as above.
Placer Permit To prospect undeveloped lands previously claimed under the Placer Law. "Relief Measures."	Claimed as a placer on or before Oct. 1, 1919, but no discovery made. Before Feb. 25, 1920, $250 must have been spent on each location. Not in Naval Reserve. Claimed in Alaska prior to Nov. 3, 1910. $250 before Feb. 25, 1920.	Not more than 2560 acres on same structure, nor more than three times that amount in same state. If grouped in a locality without transportation and other facilities, five 2560 acre permits in same state.	← 5 permits in Alaska, but not more than 1280 acres in any one permit.	Same as above.	Same as above.	Same as above.	Same as above.	———	Applicant must have filed relinquishment of right, title and interest at time of application for permit. [Before Aug. 25, 1920 in U. S. Before Feb. 25, 1021 in Alaska.]
Lease Following Permit Acreage developed under permit.	An area of permit within which oil or gas has been discovered.	¼ of permit. Not more than 640 acres, nor less than 160 acres.	Same as for permit.	20 years, with 10 year extensions.	$1 per acre per year, to be credited, however, to any royalty for that year. In Alaska no rentals in first 5 years. After first 5 years, rental 10 cents per acre per annum, creditable to royalties.	I. Commence drilling in 3 months. II. Continue drilling with reasonable diligence until one well for each 40 acres is completed to production, or to such depth that it can fairly be pronounced a dry hole. III. Drill offsets as required.	5 per cent. No royalty for first 5 years in Alaska. Gas to be decided for each case.	———	$5000 bond. Lease may be surrendered on consent of Secretary of Interior.
Preference Lease Following Permit Preference right to lease remainder of acreage in permit.	Same as above.	The remaining ¾ of permit.	Same as for permit.	20 years, with 10 years extensions.	Same as above.	Same as above.	Not less than 12½ per rent, per more than following schedule: — *Oil more than 30° Bé.* Wells producing Per cent To 20 bbls. per day, 12½ 20-50 bbls. per day, 16⅔ 50-100 bbls. per day, 20 100-200 bbls. per day, 25 Over 200 bbls. per day, 33⅓ *Oil less than 30° Bé.* Wells producing Per cent To 20 bbls. per day, 12½ 20-50 bbls. per day, 14⅓ 50-100 bbls. per day, 16⅔ 100-200 bbls. per day, 20 Over 200 bbls. per day, 25 Royalty in Alaska. *1st 5 years* — 5 per cent if more than 100 bbls. per well per day. None if less than 100 bbls. *5-10 years* — 5 *per cent.* 10-20 *years* — 10 *per cent.* No royalty at all if well less than 10 bbls. per day. Gas to be decided for each case.	———	Same as above.
Lease At Auction	Unappropriated acreage within known geologic structures of producing oil and gas fields.	640 acres.	3 leases, or 2 leases and 1 permit in same state, but not more than one on same geologic structure.	20 years, with right to renew for 10 year periods under such terms as may be prescribed by the secretary of the interior.	Same as above.	Same as above.	To be decided for each lease, but subject to reduction when production per well becomes 10 bbls. a day, or less.	*Bonus* — Lease awarded to bidder offering highest bonus, at stated rental and royalty.	Same as above.
Placer Lease Lease of acreage developed under the Placer Law. "Relief Measures."	Acreage included in executive withdrawal order of Sept. 27, 1909 (Nov. 3, 1910 for Alaska), and rightfully held as a placer since before July 3, 1910. Oil or gas well must have been drilled to discovery. If in Naval Reserve only the wells can be leased.	Whole geologic structure if not more than 640 acres. Not more than ¼ geologic structure and not to be more than 2200 acres when structure exceeds 640 acres in extent.	← In Alaska, 5 leases and permits in the aggregate.	Same as above.	Same as above.	Same as above.	*Oil more than 30° Bé.* Wells producing Per cent To 20 bbls. per day, 12½ 20-50 bbls. per day, 16⅔ 50-100 bbls. per day, 20 Over100 bbls. per day, 25 *Oil less than 30° Bé.* Well producing Per cent To 20 bbls. per day, 12½ 20-50 bbls. per day, 14⅓ 50-100 bbls. per day, 16⅔ Over 100 bbls. per day, 20 Gas royalty to be fixed for each case. Alaska same as Pref. Lease.	¼ of all oil and gas production previous to this new lease.	Same as above. Also, applicant must have filed relinquishment of right, title and interest at time of application for lease (before Aug. 25, 1920).
	Unwithdrawn land claimed as placer on or before Oct. 1, 1919. Discovery made on or before Feb. 25, 1920.	Not more than 2560 acres on same structure, nor more than three times that amount in one state.	← In Alaska, 5 leases and permits in the aggregate.	Same as above.	Same as above.	Same as above.	Net less than 12½ per cent. Alaska same as in Preference Lease.	Same as above.	Same as above.

FIG. 2. Outline of Act of February 25, 1920.

20–50	bbls. per day, 14⅔
50–100	bbls. per day, 16⅔
100–200	bbls. per day, 20
Over 200	bbls. per day, 25
Royalty in Alaska	

Commissioners of the Land Office. The law gives the Commissioners the authority to hold sales, after due notice, awarding leases to the highest bidders. Royalty is not less than one-eighth, and the bonus is competitive. A well must be drilled within one year.

The State Board of Public Affairs is empowered to lease, under similar conditions, the lands of any penal or charitable institution belonging to the State.

Nebraska. — Lands are offered for lease to the highest bidder at a one-eighth royalty on both oil and gas. Development must be started within one year. No person is allowed more than one section of 640 acres, and no association more than 10,000 acres, by assignment or otherwise. The lease is for three years but may be renewed on the same terms as were provided in the original lease, unless changed by future legislation made to protect the interests of the State. Nebraska State leases suffer a deserved stigma, however, as the first leases were declared invalid by the State Courts, notwithstanding which the legislature refuses to reimburse the holders for the bonus they paid.

South Dakota. — A prospecting permit is granted for one year. In case oil or gas is found, the permit is surrendered, and a five-year license taken out, allowing the removal of the oil or gas at a one-eighth royalty for oil and $100 per year for each gas well. A permit calls for payment of a fee of $100 for every 160 acres, and a license for an annual rental of $1.00 per acre with a minimum of $25; but such rental may be applied to the royalty of that license. Licenses may be renewed for five-year periods.

Montana. — Lands belonging to the State of Montana may be leased for five-year periods, at $100 annual rental, and 15 per cent royalty on both oil and gas. Not more than 320 acres may be leased to one person or company. The lessee is required to drill a well to a depth of 500 feet in the first eighteen months and 1000 feet additional in each succeeding year, unless oil or gas are found in paying quantities. In this case a new well is required each year, and it must go to a depth of 1000 feet unless stopped at commercial oil or gas at a shallower depth. Some earlier leases on more liberal terms are now extant.

Wyoming. — In Wyoming both prospectors' and operators' licenses are issued. The former allows prospecting of a tract not more than 640 acres in extent for one year, at an annual rental of not less than $100. It may be renewed, but at a rental of $200 per year. If oil or gas is discovered, the prospector's lease must be surrendered, and an operator's license applied for. It must include not more than 640

acres, at not less than one-eighth royalty, for five years, with renewal privileges beyond that time. An annual rental of not less than $100 is required, but it may apply on the royalty.

Utah. — The state lands of Utah are leased in tracts not exceeding 2560 acres at an annual rental of not less than 50 cents per acre, and for such royalty as the Board of Land Commissioners may deem fair and in the interest of the State. Rentals may be credited against royalties of the same year. Leases run for twenty years, at the end of which time they may be renewed, subject to such readjustment of terms and conditions as may be considered necessary in the interest of the State.

Colorado. — In Colorado, an application, accompanied by the proper fees, is made for a lease of State lands, and the application is accepted or rejected by the State Board of Land Commissioners. The lease is usually for five years, at one-eighth royalty, 10 cents per acre annual rental with a minimum of $50, and a drilling requirement that 2500 feet be drilled each year, the first year commencing at the end of the first six months of tenure. The maximum limit is 2560 acres, but in any case only three-fourths of the amount applied for is actually granted, the remaining one-fourth being reserved by the State. A well drilled to success gives the lessee possession of the well and the 160-acre tract upon which it is located. If the lessee shall have drilled 10,000 feet in the aggregate during the first five-year period of the lease as granted, an extension of the lease for five years may be obtained.

Washington. — The Commissioner of Public Lands is empowered to lease, for oil or gas, any land belonging to the State. A lease may not exceed 640 acres in extent. A rental of not less than $25 per quarter section per year is required and, in addition thereto, a royalty of 10 per cent on oil and gas. Operations must start within two years and proceed with diligence. The term of a lease is five years, with renewal privileges. Holders of agricultural leases have preferential rights to leases for oil and gas.

New Mexico. — In New Mexico, leases of State lands are advertised and sold at auction. Leases are for ten years and as long thereafter as oil and gas are found in paying quantities. Royalty is not less than one-eighth and rental not less than 15 cents per acre, with a minimum of $100. Not more than 25,000 acres are to be included in one lease, and the drilling of a well will exempt the lessee from payment of rentals for the following year on 5000 acres.

Texas. — All public school, university, asylum and other lands, including stream beds and the like, which belong to the State, and lands

upon which the State has reserved the mineral rights, are open to prospecting and development. Prospecting permits may be issued for two years upon not more than 2560 acres in each permit at an annual payment of 10 cents per acre. No limit is placed on the number of permits that may be held by one person or corporation, but if several permits of the maximum amount are held, they must not be less than 2 miles apart. Operations must be commenced on each permit within one year.

Upon the development of petroleum or natural gas, the prospector is entitled to a lease upon the full area of the permit. The term of the lease is ten years or less if desired by the applicant, with the option of renewals for like periods. The annual rental is $2 per acre, and a royalty of one-eighth of the gross production of petroleum is charged in addition to rental. A gas well is charged with a royalty of one-tenth of the value of the meter output of all gas disposed of off the premises. Permits and leases may be transferred.

The holder of land obtained in fee from the State may lease it under any terms he may desire, so long as his lessee pays to the State 10 cents per acre per year in advance, and in case of production, a one-sixteenth royalty.

Arizona. — State lands are open to leasing, upon application to the State Land Department.

Illinois. — The State has no lands except those that are being used for park purposes, and on these no grants of any kind are made.

Kansas and North Dakota. — These states do not provide for oil and gas leases on their own lands.

Michigan. — Mineral rights, including oil and gas rights, are reserved when State lands are transferred to private owners. The State Land Commission has the right to lease the oil and gas rights owned by the State upon such terms as it deems just and equitable.

INDIAN LANDS[1]

Although there are Indian lands in most of the Western States, Oklahoma is as yet the only one in which they have proved to be of great importance to the oil producer.

The Indians formerly held their land in common for the benefit of all members of the tribe, but from time to time the Government has

[1] Oil and gas leasing regulations covering both allotted and tribal lands may be obtained from the Office of Indian Affairs, Department of the Interior. The reader is also referred to Rice and Lyons, "The Oil Operator in Oklahoma."

divided up the tribal estates among their members, or in other words, allotted the lands in severalty. At first the allotted lands were under restrictions against alienation, so that the Indians could not sell or lease them, except to Indians, without permission of the Secretary of the Interior; but by various acts these restrictions have, in many cases, been removed. In general, allotted lands of Indians having less than three-quarters Indian blood are free from restrictions.

The leases which may be taken from Indian landowners are, therefore, as follows:

(1) *Commercial lease.* — This term refers to the ordinary lease as previously described. Commercial leases are taken on all Indian lands from which the restrictions have been removed. These include an ever-growing majority of lands.

(2) *Departmental lease.* — Lands which are still under restrictions against alienability can be leased, but on a somewhat different form and with the approval of the Secretary of the Interior. The terms as to rental, being more severe than is customary in commercial regions at similar distances from wells, have the effect of making these leases less desirable, so that the commercial leases are taken up first and in some regions only the commercial leases will be taken.

(3) *Minor leases.* — Leases from minors, or persons who have not reached the age of competency, must be executed by the guardian of the minor with the approval of the proper court. Such a lease may be a commercial or a departmental lease, as indicated above.

(4) *Lease on inherited lands.* — A lease from a full-blooded Indian heir must also have the approval of the County Court having jurisdiction in the settlement of the decedent's estate.

Osage Reservation. — Special laws and regulations apply to the Osage Indians. In 1906, Congress directed that all lands belonging to the Osage Tribe should be allotted to the members of the tribe, but that the oil, gas, and other mineral rights should be reserved to the tribe as a whole for a period of twenty-five years from 1906. Leases could be made by the tribe through its tribal council, but only three were given up to May 31, 1917. One of these was very large and was sub-leased in fractions.

Beginning with May 31, 1917, the Department of the Interior has held sales, at which one-hundred-and-sixty-acre tracts of Osage land are offered to the highest bidders. These auctions are held at the Osage Agency at Pawhuska, and the proceeds go to the tribe.

Leases are for five years and as long thereafter as oil or gas is found in paying quantity, except that originally this period could not extend beyond 1931, the date to which the title to the minerals was to remain in the Osage Tribe. In 1921, however, Congress extended the time to 1946, and further provided that leases should run as long after 1946 as oil or gas is found in paying quantities.

A well must be drilled to the Mississippi lime in the first twelve months, unless oil or gas is encountered in paying quantities at a lesser depth, or unless the time is extended by the Secretary of the Interior. Such extensions were common during the depressed period in mid-1921. Royalty is one-fifth if the producing wells average 100 or more barrels of oil per day, and one-sixth if less than 100 barrels per day. The bonus is competitive. West of Range 8, a lessee may hold any number of acres he desires, but east of that line not more than 20,000 acres.

A geological survey of nearly all parts of the Osage has been published by the United States Geological Survey in pamphlet form, each number describing a small unit. Surveys of the remaining townships are in preparation.

CHAPTER VI

OIL AND GAS RIGHTS IN OTHER COUNTRIES OF NORTH AND SOUTH AMERICA[1]

CANADA

In those portions of the older provinces of Canada which have been settled longest, as in the oil fields of Ontario, the mineral rights belong to the private landowners. These portions, in general, comprise the zone along the southern border of Canada. In them, the privilege of exploring and of developing oil and gas pools may be obtained by means of a commercial lease of a type similar to that used in the United States.

North of the belt of privately owned lands are the public lands. In the Eastern Provinces and in the Province of British Columbia, mineral rights on the public lands are disposed of under specific laws enacted by the various provincial governments. In the Provinces of Manitoba, Saskatchewan and Alberta, and in the Northwest and Yukon Territories, the Dominion Government retains control over the lands and minerals and imposes regulations for their disposal.

In western and northern Canada there are also large quantities of railroad and Hudson Bay Company lands, some of which have been sold to individuals; and in some parts of these the mineral rights have been reserved.

Canada pays a bounty of $1\frac{1}{2}$ cents per imperial gallon on all oil having a specific gravity of not less than 0.8235 at 60° F. (40° Bé.) which is produced within her borders.

New Brunswick. — The General Mining Act provides for the issuance of a license to prospect public lands, or private lands where mineral rights are reserved. The maximum area for each license is 5 square miles, but more than one license may be held. The initial cost is $20.

This holding is succeeded by a license to develop or work a square mile, selected by the licensee from the area covered by his license to search. The cost of the license to work is $50, and it is good for two years, with the privilege of extension to three years upon payment of

[1] See especially, " Petroleum Laws of All America," by J. W. Thompson. U. S. Bureau of Mines, Bulletin 206 (1921).

$25. Work must be commenced within this term and diligently prosecuted.

At the expiration of the license to work, a lease may be taken. It is for a twenty-year period, subject to twenty-year renewals up to a total of eighty years. Royalty on licenses and leases is 5 per cent on both oil and gas.

In New Brunswick it is further placed within the power of the Lieutenant Governor-in-Council to grant, for the purpose of stimulating development, to a corporation of sufficient ability, a special license to search, covering any specified area or areas. This is good for five years. Twenty thousand dollars must be expended within the first two years, not less than $20,000 for each year thereafter, and not less than $100,000 in the whole five years. Upon discovery of a well that can be operated at a profit of 6% or more, a lease may be given, to include not more than 10,000 square miles. Its duration shall be not more than 99 years at a royalty of not less than 5%.

Quebec. — A permit or " ordinary license " may be obtained to explore public lands for oil or gas. The maximum area is 1280 acres, and the term is one year, with the option of a one year renewal. Work must be done to the value of $1.00 per acre per year.

When oil or gas has been discovered, a lease, or " long term license " is granted for a ten year period, at a rental of 25¢ per acre per year. This long term license is renewable in 10 year periods as long as oil or gas is produced.

Ontario. — In Ontario, there are some public lands and some lands in which the mineral rights have been reserved to the Crown, especially in the newer parts of the province. Oil and gas rights may be obtained by means of a prospecting permit for an area not exceeding 640 acres, and for one year subject to renewal. This permit costs $100, and $2 worth of work per acre must be performed in the Year's tenure. If a discovery is accomplished, the prospector is then entitled to a lease, for 10 years with renewal privileges, at a cost of $1 per acre in advance and requiring $2 worth of work per acre per year in the operation of producing the oil or gas.

British Columbia. — This province also issues a prospecting license for not more than 640 acres, for one year. The initial cost is $100 and the permit can be renewed upon satisfactory evidence that work has been done. The discovery of oil is followed by the granting of a lease, good for five years and subject to the payment of an annual ground rental of 15¢ an acre, and a royalty of 2½¢ per barrel of oil. At the ex-

piration of this lease, the producer is entitled to purchase the land including the coal, petroleum and natural gas thereunder for $20 an acre or in case the surface rights have been sold, he may obtain for $15 an acre such rights to coal, petroleum and natural gas as were not sold with the surface.

Crown Lands in Western Provinces. — This includes the public lands in Manitoba, Saskatchewan, Alberta and Yukon Territory, the railway belt in the Province of British Columbia, and the $3\frac{1}{2}$ million acres of land in the Peace River district acquired by the Dominion Government from the Province of British Columbia. The Northwest Territories will be considered separately. In these Crown Lands of the western provinces, the oil and gas rights are obtained by means of leases for a period of twenty-one years, subject to renewal for twenty-one years. The rental is 50 cents an acre for the first year and $1 an acre for each subsequent year. An oil royalty of not more than 5 per cent nor less than $2\frac{1}{2}$ per cent is charged for the first five years, from 5 per cent to 10 per cent the second five years, and 10 per cent thereafter. The maximum area of location is 1920 acres, but by assignment a person may acquire a greater area. Application for a lease must be made to the Agent of Dominion Lands for the district in which the land is situated, or to a subagent. In any question of priority, however, the date of receipt of an application is the date on which it is received by the Agent. The lessee must have machinery for prospecting on the lease within a year, and must commence drilling in fifteen months. Drilling must be prosecuted with diligence, and at least $2000 must be expended on a lease in a year. The work may be done upon one lease of a group for the benefit of all the leases.

The Dominion Forest Reserves, excepting such portions as have been proclaimed Dominion Parks, may be acquired under the same regulations, with 3840 acres as the maximum area of location, and with the provision that one-half of this shall be reserved for the Crown, while the other half is developed by the claimant.

Crown Lands in Northwest Territories. — Following the discovery of oil at Fort Norman, special regulations were announced on February 11, 1921, for Crown Lands in the Northwest Territories.

A prospecting permit, good for a four-year period, must first be secured. The maximum area which may be obtained by application is 2560 acres, and it may be acquired in as many as five separate blocks; the minimum area is 80 acres. More land than 2560 acres may be acquired by assignment. Application must be filed in person with the

mining recorder for the district, or with a sub-recorder; but priority of application is based upon the date of receipt of such application in the office of the mining recorder. Rentals are 50 cents per acre for the first year, and $1 per acre for the second and third years; but the last two are not required if drilling obligations have been fulfilled. Drilling must be at least commenced within two years, and a depth of 500 feet in one or more wells must have been drilled by the end of the third year, or $5000 expended in drilling. By the end of the fourth year, drilling must aggregate 2000 feet unless conclusive determinations can be made at shallower depths.

The discovery of oil terminates the permit and the operator takes out a lease upon a square block, to be chosen by himself, comprising one-quarter of the area held in the permit. The remaining three-quarters is reserved to the Crown. The lease is for twenty-one years with the privilege of renewal for twenty-one years more. Rental is $1 per acre per year. Royalty on any lease is 5 per cent until April 1, 1926, after which it will be 10 per cent. A royalty on gas may be specified when the occasion arises. In order to use the surface for operations, it is necessary to lease as many acres as are necessary, at a yearly rental of $1 an acre. In order to assign either a permit or a lease, the consent of the Minister of the Interior is required.

Any company holding oil and gas rights must be incorporated under the Companies Act of 1906, unless they obtained their rights before these regulations of 1921 were in force. Furthermore, " Citizens of another country, the laws, customs, or regulations of which deny similar or like privileges to citizens or corporations of the British Empire, shall not, by stock ownership, stock holding or stock control, own any interest in any permit or lease acquired under the provisions of these regulations."[1]

SPANISH AMERICAN COUNTRIES

The fundamental principle that mineral rights belong to the government is strongly emphasized in the laws of Spanish-American countries. South of the Rio Grande, throughout both North and South America, the oil and gas rights do not belong to the owner of the soil to such an extent as in the United States; consequently, the acquisition of development privileges more often involves direct or indirect dealings with the government in power.

[1] Section 44 *(c)* of the Regulations for the Northwest Territories of Canada.

Mexico. — In 1884, under the régime of Diaz, the Mexican constitution nationalized the minerals of Mexico, but specifically excepted the hydrocarbons, petroleum among them. About the year 1900, Americans and others, acting on this basis, started to take leases from private owners at a 10 per cent royalty. This represented the normal method of obtaining oil and gas rights in Mexico. By the year 1917, most of the land in the oil region of the Tampico district was under lease.

In 1917, the constitution of Carranza went further and nationalized all hydrocarbons, in Article 27. However, Article 14 stated that nothing in this constitution should be interpreted in a retroactive manner. This law makes a mining denouncement, or claim, the method of obtaining oil and gas rights, although so far the companies have felt that the confused state of affairs called for preliminary negotiations with the owners of the surface rights.

A denouncement, or claim, is for not less than 4 hectares, and, in addition to taxes, requires an annual rental of 5 pesos per hectare and a 5 per cent royalty. Drilling must be commenced within three years.

It was understood that the Carranza constitution could not affect leases held prior to 1917, and the companies so held. On the other hand, the decrees of Carranza and the demands of the Mexican Government that the companies pay a royalty, in addition to the export taxes which they have always paid, have sought to make the provision in reality retroactive. The governments following the Carranza régime have said that there would be no attempt to make the law retroactive, but they have nevertheless continued to put pressure on the companies to pay royalty. The companies have refused to accede to this demand, and protests from the United States Government have had no material effect on the situation. Although the operators of the Tampico field do not hold a single acre under government concession, members of all Mexican political parties have attempted to justify their attitude by using our Public Land Leasing Act as an analogy. Among other examples cited were the Volstead Act and the Russian nationalization of Baku.

To complicate matters further, there was evolved a federal zone, which included strips along the coast and on both sides of navigable rivers and their tributaries, so that any watercourse or possible watercourse would be involved. This zone was given as a blanket concession to a single company, and whether that concession is still in operation or not, the zone has served to confuse many land titles.

In addition, other individuals have been allowed to denounce territory now held by developing companies, because the companies would not acknowledge the illegal claims of the Government by filing denouncement papers on their own property.

The situation, however, was greatly improved by the quieter condition of the country, and the decrease of lawlessness following the demise of the Carranza régime. Under the later governments a better understanding between the operators and the Mexican nation is to be hoped for, and steady development toward better conditions is generally expected.

Guatemala. — Leases on petroleum can go only to citizens, and government permission is necessary for a transfer of these rights.

Honduras. — There are no petroleum laws, and oil and gas rights are obtained only by special concession from the government. A blanket concession to prospect and develop is in force in Honduras until 1944, according to a Congressional enactment of April 3, 1919.

Costa Rica. — Petroleum claims may be denounced. The maximum size is 2000 meters on a side, and operations must commence within two years. The government must be paid 5 per cent of the value of the oil at the well. The law of 1913 annulled the application of the former mining laws to petroleum, but recognized the legality of rights obtained under the previous laws.

Large concessions have been given in the past. A Sinclair subsidiary holds the largest concession along the Caribbean coast.

Cuba. — Petroleum rights in Cuba are Government property and are obtained by denouncement, in accordance with the old Spanish mining code. Conditions, so far as the legal phase is concerned, are good.

British West Indies, British Honduras, Trinidad, Etc. — These, as British colonies, are practically closed to foreigners. Many American companies are deterred from entering this territory by the feeling that they would not be allowed to obtain a foothold, although no definite law to that effect is known.

Panama. — Much of the leasing for petroleum has been from private owners. On the public lands the Executive grants prospecting permits of one year's duration and covering 25 hectares (one hectare = 2.471 acres). Upon any discovery of oil which appears to Government experts to be capable of producing at least 1000 liters of oil per day or 10,000 liters of gas per day, a ten-year lease is given, and may be extended an additional ten years. The lease itself may cover a tract 1000

meters long and 400 meters wide. The operator must pay to the Government 5 per cent of the gross product of the business.

Salvador. — A law passed April 18, 1918, returned to the Government the possession of all minerals, including petroleum and natural gas, but this law recognized the legality of existing rights.

A concession to explore and develop any unexploited land in Salvador was given in 1913 and confirmed in 1919. Exploration is permitted until December 31, 1929, and operators are granted the privilege of working for thirty years any oil deposits that may be discovered. The concession calls for a 10 per cent royalty.

Argentina.[1] — The State owns all petroleum.

Some concessions have been given to foreign companies, but the success Argentina has had in developing the Comodoro Rivadavia field has led to a strong tendency toward operation by the Government itself.

Bolivia. — Petroleum belongs to the Government, and public and unenclosed private lands may be prospected without a license; but a license is required on enclosed private lands. Concessions, giving further rights of possession, may be obtained from the Government on payment of a license fee of 4 bolivianos per hectare.

The greater part of the prospective oil regions are now held under large concessions, with a few small holdings about some of the seepages.

Brazil. — Petroleum rights on public lands belong to the Government, and on private lands to the owner. Permits to work may be obtained from private owners, and in case of discovery the deposit belongs equally to landowner and prospector. Public land may be prospected under a license from the Government, and in case of discovery a concession is granted for a period of fifty years at the most.

There seem to be no restrictions on foreign individuals or corporations.

British Guiana. — None but British subjects can obtain concessions for the development of petroleum.

Chile. — Mineral rights belong to the State, even under land of which the surface is privately owned. Anyone may prospect uncultivated lands, but a license must be obtained. If a landowner refuses a license, it may be granted by the judge of the proper locality.

[1] For all South American countries, see, in addition to Bulletin 206, U. S. Bureau of Mines, J. W. Thompson, Petroleum Production in South America with Relation to Recent Petroleum Legislation: United States Bureau of Mines, Reports of Investigations, Serial No. 2250, May 1921. Also in California Oil World, May 26, 1921, page 25.

Colombia.[1] — On December 30, 1919, a law was passed by the Colombian Congress to regulate the acquisition of petroleum rights and to settle differences of opinion in regard to the rights that the Government was claiming in the subsoil of private properties.

By this law, the public lands of Colombia are thrown open for prospecting under a Government license, discovery to be rewarded by a lease for the development of the deposit, covering not more than 5000 hectares nor less than 1000 hectares. The term of the lease is twenty years, with the possibility of extension for ten years more under laws in force at the time. A royalty must be offered by the applicant. One individual or corporation cannot hold more than three claims in any one Department or District, whether obtained by direct application, or by assignment.

Aliens and foreign corporations must comply with all the laws relating to alienship and naturalization, and agree to the requirements of this law as to taxes, rate of royalty, causes of forfeiture, etc. A difficult provision is that by which all machinery and equipment are forefeited to the Government without compensation, at the end of the term of holding.

For administration purposes, and also for the levy of a development tax, the law divides the Republic into three zones, as follows:

Zone 1 — Lands lying at a distance of 200 kilometers or less from the sea coast.

Zone 2 — Lands lying 200 to 400 kilometers from the sea coast.

Zone 3 — Lands lying more than 400 kilometers from the sea coast.

Taxes are levied on production from public land leases at rates of 10 per cent, 8 per cent and 6 per cent on zones 1, 2, and 3 respectively.

Besides the public lands, the law also specifies three other groups of lands in Colombia.

1. This group includes private properties and Government sales of public lands, the titles of which were issued previous to October 28, 1873. For a twenty-year period from the date of the law (December 30, 1919), owners of these lands may avail themselves of their own rights to the petroleum deposits. If they have not taken advantage of favorable prospects at the end of that time, the Government will levy an annual tax of $5 per hectare until exploitation is undertaken. Taxes are 8 per cent, 6 per cent and 4 per cent on Zones 1, 2, and 3 respectively.

[1] H. de le Esperiella, Oil Lands of Colombia, Magazine of the New York Petroleum Exchange, December 1921, page 16.

2. In the second group are those lands which were sold as uncultivated Government lands after October 28, 1873. The owners of such lands were given preference rights on leases for a period of two years from the date of the present law, after which applications from anyone might be accepted. Production taxes are 10 per cent, 8 per cent and 6 per cent on the three zones, and there are, in addition, annual charges of 10 cents per hectare in the first year, 20 cents in the second year, 50 cents in the third year, and $1 in and after the fourth year.

3. The third group includes those lands on which titles to "oil mines" were issued by the Government in 1912 and 1913 up to April 1st. These can be developed at any time by the holders of the title, and the taxes are the same as in the second group.

The law furthermore makes exceptions for the following regions:

1. "From a point 18 kilometers to the east from Punta Arboletes, a straight line ending at Cape Tiburon; to east and west, two parallel lines which from the points mentioned above will go southward, following the same direction 60 kilometers from the base of the Gulf of Uraba; to the south, a line drawn from east to west joining the two parallel lines mentioned above."

2. Government lands "from a point halfway between Cocalito and Punta Ardita to the boundary line with Ecuador, a zone of 20 kilometers in width and, besides, to the territorial sea zone corresponding thereto."

The first exception is that within these regions there shall not be any preference rights by reason of discoveries. In the second place, the minimum tax for exploitation shall be 20 per cent of the gross products. Thirdly, no one person can lease more than 5000 hectares; except in cases where the agreement may include financial operations which will result in acquisition for the public exchequer of a loan of not less than $20,000,000, in which case the lease may cover 100,000 hectares.

Ecuador.[1] — The right to develop the public lands of Ecuador is obtained by means of a lease of twenty years' duration, with the option of ten-year renewals. The maximum area which may be held under lease in any one canton is 5000 hectares, and the minimum is 500 hectares. In a province, the aggregate maximum is 15,000 hectares. The lessee must pay a royalty or tax of from 5 per cent to 12 per cent, depending on the location, this tax to be increased every ten years but not in sufficient amount to exceed the 12 per cent maximum. Rental is

[1] Translation in Oil & Gas Journal, December 23, 1921, page 70.

levied at the rate of 20 cents per hectare for the first year, 40 cents for the second year, 80 cents for the third, and 1 sucre for the fourth and each remaining year.

If the lessee is a foreign company, an attorney or manager must be appointed. The person selected must possess proper qualifications and sufficient power to act in conformity with Ecuadorian laws.

Exploitation must be started within four years, and, once started, must not be interrupted for as much as three months except because of unavoidable delays.

If a lease is terminated as a penalty, its plant, machinery, etc., become the property of the State without compensation.

Owners of "oil mines," with titles conferred under the Code of Mines and former laws, may enjoy their holdings for a period of fifty years from the date of the law (October 8, 1921), provided they have fulfilled all their obligations. Rental in this case is 15 sucres for every pertenencia or mining claim, and royalty is the same as for a lease.

Paraguay. — The State owns all minerals except building materials, and individuals or corporations may obtain rights through Government concession. A tax of 20 cents Argentine gold per hectare is required, as well as 5 per cent of the gross products.

Peru. — Large concessions have been granted, and there has been production on some of them since the late eighties. Exploration and development have been generally encouraged, but details of procedure await the passage of a new law.

Uruguay. — There is no law relating to petroleum. The Executive, however, has been authorized to appoint a committee to revise the mining code.

Venezuela. — Venezuela controls all mineral rights, and any contract for the exploration and development of petroleum must be made with the Government, under the law of June 19, 1920.

The first step on public lands is an exploration permit leading to discovery. The permit covers 10,000 hectares, and no more than six permits can be granted to one individual or corporation. The duration is two years. For exploration on private lands, the Government can give permits for one year from the date of the passage of the law, provided the owners themselves have not already undertaken exploration for mineral products.

A lease, or exploitation contract, is granted upon the discovery of oil or gas, the area of each plot to be 200 hectares. The discoverer receives the plot upon which he drilled and each alternate plot of the

10,000-hectare tract. The remaining alternate plots revert to the Government. One person or company may hold as many as 40,000 hectares of land, under exploitation contracts obtained by original development and by assignment. The duration of the contract is thirty years.

One month after the lease is granted, the operator must pay to the Government 1000 bolivars, and each year he must pay 1400 bolivars as a surface tax. A royalty of 15 per cent is also required. The Government plots may be leased at auction, on the basis of a competitive royalty, up to 25 per cent.

Both permits and exploitation contracts may be held by aliens, and no restrictions are placed on foreign companies other then the acceptance of the Venezuelan laws.

CHAPTER VII

TRADE IN LEASES AND ROYALTIES

Oil companies are constantly seeking leases, in order to secure locations for the drilling that must be done to make up for the natural decline of their wells. This fact, together with the fluctuations of the price of these leases resulting from new successes or failures in the vicinity, leads to a great deal of independent leasing for the purpose of supplying this demand and, if possible, of anticipating it. Certain terms for such leases become customary in each field, and are modified by the various state laws and by the past experience of both farmers and operators in that region.

Under these conditions, land is leased for little or no bonus in the early days of a leasing campaign. This bonus is increased as the demand for acreage exceeds the supply in any locality.

In most districts, some of the leasing is done by those who are merely holding their leases to see if the region may not later become more promising because of successful drilling by others. Eventually, someone tries to get a solid, or nearly solid block, of sufficient size and so located as to justify a well. Frequently a larger block is obtained, and enough of the acreage sold off to pay for a part or the whole of the drilling. In some cases there is a profit on such ventures even though the hole is a failure.

This activity in the selling and re-selling of the leases becomes more active as the drilling progresses, and the advance so produced frequently causes the taking of profits on a part of the holdings. Prices of leases, of course, vary with the demand, which is dependent on the geological (real or supposed) conditions in any area, the distance from a drilling well, closeness to production, publicity, vogue, salesmanship, etc.

The landowner, of course, receives only the original bonus paid when his land is leased; this usually varies from 10 cents to as much as $5 prior to definite announcement of a well but may be higher. If he refuses to lease he may prevent the drilling of a well; but if development moves his way, he can sometimes profit by waiting and leasing later at a larger bonus than his neighbors. On the other hand, if he postpones leasing too long, the interest in his locality may be impaired

by dry holes, so that development moves in another direction and he does not receive even the smaller bonus paid his neighbors.

In general, it may be said that it is to the interest of the landowner to encourage development, if by the terms of his lease he retains a royalty on any oil production. The sooner he gets a test well put down on or near his property, the greater the chances for early profits on his part. Thus, by leasing for a small bonus and a standard rental, he makes it easier for the lessee to handle his land in trade with one company or another, and the companies can afford to gather the necessary block for a test. In case of production, his royalty is worth many times more than any bonus he could demand for leasing his land.

As typical development in the field progresses, certain individuals usually buy up the farmers' royalty in whole or in part. It is a usual procedure for the farmer to sell one-half of his one-eighth royalty, thus assuring himself a good profit and keeping the other half to await the outcome of drilling.

The majority of buyers of royalties are individuals who wish an actual interest in producing properties without the responsibility of operating. They are often officials of companies operating in the district, or others closely in touch with the field and with the larger companies' operations. A royalty interest is obviously of more value when a lease is operated by an efficient company than when it is held by a less diligent or weaker operator. Most companies find no fault with the buying of such royalties by their employees and in some cases may even encourage it. They do not, however, allow employees to hold leases in a field where the company is operating. In the first instance, the royalty holding cannot prejudice the company's interest in any way, and inasmuch as records of neighboring properties are thus made available, the company actually profits thereby. On the contrary, the holding, by an employee, of leases near a company's operation may be very prejudicial to the company's interest, and this is rarely allowed except where officials are playing their own interests against those of the stockholders.

In company operations where all details are directly under the eye of a responsible executive, certain employees may be allowed to acquire acreage, provided all leases are first submitted to the company. The practice can only be justified by the utmost frankness between active parties at all stages. There are certain ambitious, aggressive employees who are too valuable to lose, and whom a company cannot hold except by permitting them to make extra money in lieu of additional salary.

Furthermore, the holding of leases keeps employees in close touch with the field and stimulates their interest, which indirectly is also to the company's interest. It is always a dangerous procedure, however, as the company's interest may later conflict with that of its employees, and, in case the land becomes valuable, there often arises a question as to why the company did not take it in the first place.

The general speculation in leases and royalties, which has developed around the legitimate business of oil-field operation, has been highly stimulated in recent years, and has brought into play a parasitic type of trader who is usually called a " lease grafter," although this term is sometimes improperly and loosely applied to all leasers. Narrowly speaking, a " lease grafter " is one who resorts to deceit in his operations. He was particularly active in Texas and Louisiana during 1919 and 1920, when so much outside money was being put into wildcat operations by persons and companies desiring to avoid paying large Federal taxes. These persons were obviously not good judges of values, and they bought indiscriminately, often through unscrupulous " lease grafters."

A broker or speculator owning leases in a desirable district may turn in all or part of each acreage for any one of several kinds of considerations, the most common being:

1. All or part cash.
2. An additional royalty, payable by the operating company, with the condition that a well be drilled.
3. A " working interest " in the property. The seller then becomes a partner, paying his share of the expense of development out of oil produced.
4. An added royalty on the first well drilled and a working interest in any additional wells. Such working interest is commonly one-eighth.

An additional royalty is obviously more valuable than a working interest, but the granting of it is very dangerous to the operating company. As it must be added to the original royalty paid the landowner, the royalty owners may often make more out of the lease than the operating company. It is only justified where the lease in question is in the center of a producing area, where the production is assured, and its size and character readily predicted. Where the outstanding royalty is high, it will become a burden on the lease after wells have declined to a small daily production, at which time it will result in a premature abandonment of the lease unless a readjustment is made. A working interest, on the other hand, bears its own proportional share of operating expenses.

CHAPTER VIII

MODES OF INDIRECT DEVELOPMENT

There are a number of ways in which an investor or a company can participate in the profits of the development of an oil field, without directly taking leases and drilling them or buying producing properties. The main methods can be described as follows:

(1) **Stock Purchase.** — The individual may select a company in which to buy stock, thus becoming a partner in the ownership of oil properties and a participator in the new ventures the company undertakes. The principal advantage is the lessened risk incident to having one's money spread over more properties and ventures. Secondly, there is the advantage of thus obtaining the services of a highly efficient staff if the selection is well made. There is also more continuity in good company operations, so that such an investment can usually be carried for considerable periods of time without attention or worry.

The decisive feature in investigating a company stock is the ratio of its market value to the value of the properties, plus its "going concern" value. The danger lies in the excessive stock that may have been issued for properties already condemned by unsuccessful drilling, or promotion in excess of its proper reward. Legitimate allowances for promotion or other elements of "going value" should, of course, be expected.

(2) **Buying Royalties.** — It is a frequent procedure for the landowner to sell the whole, or more frequently a half, of his royalty. This may be sold previous to development, while drilling is in progress and only partly completed, or as a royalty on a producing property. For those who have sufficient ability and data to judge properly the promise of production and probability of development, the purchase of royalties offers an excellent investment. On the other hand, the prices obtained by promoters for small fractional units of royalties are usually unduly inflated.

In general, royalties on fully developed producing properties sell too high, as do those on wells of a spectacular sort, since these overstimulate the market and have, furthermore, a more rapid decline. The royalty buyer should always carefully consider the decline curve.

The value of a royalty interest in an undrilled lease is speculative, and the price paid will vary with the demand for such royalties in any particular district and with the confidence the owners have in the promise of production. The price is governed by the following factors:

(*a*) Type and reputation of the lessee, especially whether a responsible operating company or an individual speculator, not in a position to drill reliably, if at all.

(*b*) Prospects of well-guided drilling in the vicinity in the not-too-distant future.

(*c*) Geological evidence of oil or gas probabilities of the tract.

(*d*) Character of the nearest producing wells, as to life, productivity and grade of oil.

The price paid per barrel of royalty oil in a producing lease is, of course, higher than the barrel price for the working interest in the lease, as the royalty oil is free from any charges of operating expense or future drilling. Its appraisal is easier and more reliable, yet it is a highly technical matter.

(3) **Buying Offset Leases to Drilling Wells.** — This is a common practice on the part of large companies, as well as individuals. It is a highly speculative venture, but it is considered good practice at the prices which can, not infrequently, be obtained, if the buyer restricts such purchases to properties where (*a*) the geological evidence is favorable; (*b*) the contractor drilling the well is thoroughly reliable; and (*c*) the depth planned is sufficient to test the principal sands. The price must be scrutinized as closely in this type of investment as in others.

(4) **Dry Hole Contributions.** — Where several companies are represented by leases in a certain district, possibly with none holding a solid block, one of these companies may decide to drill, provided certain others will contribute a portion of the cost of a well, either as a donation or, more frequently, in case the well fails to become a commercial producer. In the latter case, the contributions are called " dry hole contributions," and the well is usually so located as to make the best test of the leases of the parties so contributing. This contribution may be in cash, or may consist in the donation or loaning of material, such as fuel (gas), casing, rigs, etc. In many cases, such a test will furnish the basis on which the various companies interested will decide whether or not to surrender their leases, or, in case of success, to drill them. A not infrequent blunder is to move the well from the best location to some

other point, in order to draw out more or larger contributions of this sort.

(5) **Well-share Purchases.** — A lease or group of leases is sometimes divided up into small fractional parts. Direct assignment is then made to investors, with an agreement to spend the money so paid in drilling a well on a certain location or locations. In case of success, it is further agreed that, after operating expenses are paid, all lessees of individual lots shall participate equally in the profits of the well, and in succeeding wells.

Theoretically, by buying such lots in a number of such communal leases, one could spread his risk over a great number of wells. Actually however, the value of this form of participation depends largely upon the character and experience of the persons operating the lease, and in this type of enterprise these are generally poor. The interest of the enterpriser usually becomes very perfunctory after selling the leases, which have been his main interest, and there is too generally a lack of diligent effort and little or no continuity of program thereafter.

The success of an oil operation depends upon so many factors besides putting down the first hole in the ground that the procedure mentioned above is not recommended to the investor.

In conclusion it may be stated that investors, especially small investors, should limit themselves to stock purchases, unless they have far more than the usual amount of ability and information, or are associated with one who has. On the other hand, an individual investor with ample capital can far more profitably act individually or with a small syndicate, if the capital is sufficient to take up the risks involved by an adequate number of ventures pooled; and if such an investor has sufficient executive ability to select a buyer with the necessary training, experience, and honesty, he has already available most of the needed data.

CHAPTER IX

SIZE AND SCOPE OF OIL COMPANIES

Concentration. — The relative economy and efficiency of large and small producing companies is a matter of great interest and importance. The following theoretical considerations, as well as actual practice, all point to the overwhelming advantage of large units of capital and management.

The advantages of the large company are as follows:

(1) By operating in more than one district, the risk is spread and thereby reduced, as compared with that of a small company operating in but one field.

(2) The company has access to a much larger percentage of well records and information concerning the subsurface of the vicinity, as well as general geological data.

(3) More efficient and more highly specialized men may be employed.

(4) The number of offset wells to be drilled is considerably reduced, because larger leases are controlled.

(5) A larger number of wells can be connected up and pumped by one power.

(6) Economy in labor is effected by having one pumper tend several neighboring powers.

(7) There is more continuous utilization of the plant and equipment, such as pulling machines.

(8) Time and teaming are saved by maintaining well-distributed and well-stocked storehouses.

(9) A gasoline extraction plant can be installed, because of the company's control of the necessary number of neighboring wells.

(10) Pressure may be conserved and water or air flushing can be more frequently employed when the whole pool is owned by one company, or by but a few companies whose managers can easily reach an agreement. It is most difficult to reach such an agreement where there are many small lease holders.

(11) Important experiments can be tried, such as testing the relative merits of competing methods of production and materials.

(12) There is greater uniformity in the procedure of completing wells so as to take care of local water conditions.

(13) More compact areas can be surveyed more economically.

(14) By holding several contiguous leases, instead of a few scattered ones, a large company may "feel out," from established production, location by location, relatively unhampered by property lines.

(15) A company that holds several contiguous leases is far less frequently forced, by the terms of the lease, to drill before needed information is at hand.

(16) The logs in a large company, if well managed, are more uniformly recorded and are always available; whereas, among many small companies there are invariably some who keep very poor logs, or keep them secret, and there may be some who even falsify their records.

(17) Supplies are better in quality and lower in price when they are purchased in large lots.

(18) A large company can economize by drilling its own wells, instead of letting them out to contractors. If, because of the difficulty of securing a competent superintendent of drilling, the company prefers to contract, cheaper rates can be obtained by a large company because there are many wells close together in one contract, giving the contractor continuous employment and as a consequence permitting lower bids.

(19) There is less danger of premature flooding by water from improper casing or plugging; also less waste of gas by small, irresponsible or incompetent neighbors.

Integration. — The foregoing considerations apply to the greater efficiency of concentrated or large producing companies. The following considerations indicate the higher efficiency which results from the integration of the industry, that is, the bringing under one management of the various successive steps in the oil and gas industry, such as production, transportation, refining and distribution.

(1) With integration it is possible to store oil in relatively few, large, central steel tanks; otherwise the oil would be stored in numerous, small, and more probably leaky tanks, and would deteriorate more rapidly.

(2) Gasoline extraction plants, installed for handling gas from wells, can also recover gasoline from the vapors of the pipe-line company's storage tanks.

(3) By controlling, to a certain degree, the rate at which wells are drilled, the danger of overproduction is reduced; at the same time,

the amount of production is better adjusted to the needs of the refinery.

(4) The oil and gas business should be in the hands of the same company, as otherwise the one-sided eagerness of the oil producer may lead him not only to waste vast quantities of gas, but also to render the search for gas more difficult and expensive on the part of the gas company.

(5) Pipe lines and laterals can be planned in a more systematic and far-sighted way, and will less frequently be left without supplying leases.

(6) In many cases, water for pumping and drilling can be more cheaply supplied from the provisions already existing for the needs of the pipe line.

(7) The guarantee of a regular production makes for greater economy and efficiency in the refinery, as well as in the marketing of the oil.

Comparative Efficiency of Oil Companies.

The relative advantage of investment in either of two companies, one a large, sufficiently capitalized and well-integrated company, and the other a small company of limited scope and field of operations, will depend in large part upon the proper balancing of the effect of the following factors:

(1) Does the large overhead organization of the one company so slow down its operations that it cannot compete with its more active, aggressive competitors?

(2) Are the officials of the large company so occupied with their routine work or personal affairs as to prevent the company's receiving their best interest and enthusiasm?

(3) Do factional troubles among different groups in the larger company seriously affect its efficiency?

(4) Is there good cooperation between various department heads, enabling the company to operate successfully in several fields?

(5) Do so many heads have to pass on important decisions as to seriously hamper active competition for properties?

(6) How much working capital, as opposed to fixed capital, has each company?

(7) Does the greater scope in operation of the large company reduce its risk of failures sufficiently to compensate for its greater cumbersomeness?

(8) Does the ability to command the services of high-grade and high-salaried men, to handle the large-sized operations of the big company, compensate for the greater personal interest of the actual owners, who function as executives in the smaller company?

It is true that small companies frequently grow much faster than large ones, for in no other industry do skill and foresight give such large and quick returns. A large company may develop an important new field without much change in its general condition. However, companies with small capital and occasional extraordinary earnings are obliged to pay a disproportionate share of such earnings in Federal taxes. A high degree of executive ability and foresight on the part of the management of any company, large or small, will compensate for many disadvantages in other directions.

A review of the independent oil companies of the country shows only about half a dozen that are strongly equipped with production, pipe lines and tank cars, gas-gasoline plants and marketing facilities. In times of financial stress or of wide oscillation in the price of crude oil and its products, such companies are in the best position to weather the storm; while the less well-balanced oil companies are the ones who usually fail and are absorbed by their stronger competitors.

The methods and policies followed in managing a large, well-integrated company differ from those used in the case of a small producing company. In certain notable instances, executives who have successfully managed such large properties, and have later resigned to engage in their own operations on a smaller scale, have been unsuccessful through failure to adapt their methods and policies to the problem in hand.

Syndicate Operations. — The enterprise conducted by an individual, or one of its modifications, such as the partnership, syndicate and trusteeship, is a convenient method during the search for and preliminary drilling of properties, before operations have narrowed down to certain districts or any one field. It has the advantage of flexibility of movement, no corporation red-tape being involved in buying or selling leases or physical property, and it avoids corporation taxes and reports which are heavy in certain states.

The syndicate, or partnership, has the disadvantage of unlimited liability upon the part of its members, and the obstructions which can be put upon its routine management by any individual member, in case he should so desire. The trusteeship avoids the last disadvantage,

but is not practicable except in cases where mutual confidence is at a higher point than usual.

After the prospecting period has been passed, and the period of development of specific properties begins, it is usually desirable to incorporate for the purpose of taking over the valuable portion of the holdings of such a syndicate. Such incorporation may make possible the realization of some of the profit earned by the appreciation of the property, but it may also be used to raise developmental capital with the advantage of having the capital so raised share in the risks.

Such a reorganization also makes it possible to charge off, as individual losses, the cost of surrendered properties and leases, dry holes, etc., for which money has been spent previous to the time of incorporation.

Company and Department Relationships. — A company restricting its operations to producing oil is often dependent upon arbitrarily low prices paid by pipe lines or refineries for its crude oil. This is particularly true when there is little competition for the oil. Thus, the Magnolia Petroleum Company was the only important purchaser of oil in the early days of the Healdton pool. Until other pipe lines and the railroad were completed, the price of Healdton oil was kept below its real value as compared with other crudes. Elk Basin oil does not yet command a price commensurate with its quality.

Thus, an independent producing company is dependent upon the price which the larger pipe lines, in their stronger bargaining position, offer to pay for the oil. Such a producing company is in a weak strategic position during periods of overproduction, such as that which occurred at Mexia in November 1921. Here the price varied from 75 cents to $2.25 in nearby counties, for oil not greatly different.

The logical step for such a company, when it is large, is to build a pipe line to a nearby independent refinery, or at least to a railroad loading rack where shipments can be made to some refinery competing with that affiliated with the pipe line which would otherwise take its oil. Such a pipe line may pay expenses by carrying the oil of neighboring producers, but such receipts must be looked upon as supplementary. An essential feature is that the company must have an assured adequate supply, either its own or one secured, by a firm contract, from properties with a promising future.

The relief offered by a pipe line to a railway, or to a refinery which will use its full power to get the oil as cheaply as possible, is far less than that made available when a refinery is owned by the producing company. This is, of course, most evident where the oil is kept at a

disproportionately low figure because of some feature of inferiority which is exaggerated, or where the oil is of extra good quality and is yet allowed only the regional price. As a general rule, therefore, large producers eventually become refiners, or enter a merger that contains one or more refineries.

It is very seldom that a wholly independent pipe line arises merely as a pipe-line company. The nearest approach to this condition is realized when several operators in a pool jointly subscribe to a pipe line to give themselves relief. Such a pipe line, however, is clearly an appendage of the producing companies, even though the ownership is divided.

On the other hand, the independent refinery is normally obliged to pay a premium over the offering of the large pipe lines of the district, partly because the producer feels less assured of a persisting market, but mainly because the producer is in a stronger bargaining position. Since the independent refiner already suffers from operating a smaller unit, this premium is a direct loss that is seriously felt. It is not surprising, therefore, that he strives to avoid it by buying producing properties, as in this case he is under no hardship and can buy to good advantage in an open market.

The transportation from refinery to marketing point requires a large and expensive equipment of tank cars and tank wagons. This business, from its large capital demands and necessity of assured market for refiners, has fallen mainly into the hands of the refiners rather than the marketers. There are a few tank car companies, but they are nearly all subsidiaries to a refinery.

There are many small independent marketing agencies; but the ordinary advantage of integration in eliminating the selling cost between refiners and marketers is so great that, except where there is a countervailing advantage in their separate existence, marketers are being absorbed by refining companies. There is an equally evident and rapid expansion in the number of marketing stations erected by the refiners, because the automobile, one of the principal consumers, does not require delivery but merely a marketing station on a much traveled road.

The foregoing considerations make it desirable for a company, which expects to operate continuously and at a maximum profit, to have a well-integrated corporation composed of all four elements — production, transportation, refining and marketing.

Upon the bringing in of large amounts of flush production, with

correspondingly cheap crude oil, in any district where the oil has a good gasoline content, there spring up small independent topping or skimming plants, designed to recover the gasoline content, and sell the balance as fuel oil. This sometimes gluts the nearby markets with fuel oil, which becomes hard to move and fills storage space that should be kept for cheap crude oil. Since this is a distinct economic loss, and the depletion usually exceeds expectation, the life of these plants at full capacity is ordinarily short.

In periods of rising prices of crude oil in recent years, the large, well-equipped refineries have kept the price of gasoline advancing at a lower rate, making much of their profits from lubricants. This puts pressure on the small skimming plants, which were not equipped to manufacture anything but gasoline and fuel oil, and led to many abandonments or reduced runs during high crude prices, with active operation during low crude prices. In view of the wastefulness of such skimming operations, the net result of these conditions is an improvement in methods.

In 1921, an anomalous condition was brought about in the Healdton crude oil market. A flood of Mexican crude filled the Gulf Coast refineries, and improved refinery methods were making it more and more valuable for refinery purposes. However, owning to the cost of production, taxation and transportation, Mexican crude could not be delivered to Gulf Coast ports for less than $1.10. Meanwhile, the price for Healdton crude dropped to 60 cents, although it was a much superior oil. This evidently resulted from the fact that most of the Healdton was refined at the Gulf Coast, and it was expected that the readily accessible cheap oil of the Mexican field would be exhausted in a few months, while Healdton was a reserve which would still be available after Mexican oil had been exhausted. The pipe-line companies had extensive investments in Mexico, which had to be liquidated during the presumably short life of that field.

The foregoing analysis shows the reason why a well-integrated company, producing, transporting and refining Healdton oil would be making its best profits during such a period, in which the price of Healdton oil in the ground had fallen in much greater proportion than the selling price of refined products.

Such a company as the one described can well afford to build tankage and store large quantities of cheap oil, wherever it appears, for future refining prices. Several of the large Mid-Continent companies owe their first big start in those fields to their large purchases of cheap

Cushing crude in 1915–1916. Excellent profits were made by tanking Healdton and Eldorado crude, and are now being made in a similar way at Mexia.

The six or seven strongest oil companies operating in the Mid-Continent fields have become well-integrated companies through the process described, and the process continues.

CHAPTER X

FINANCING OF OIL COMPANIES

An oil company may be formed for any one of the following purposes, or a combination of several:

1. To take over syndicate properties, or purchase a producing oil property or group of such properties, stock, notes or bonds being sold for the purpose.
2. To finance the bringing together of integral units of a complete oil-field operation, such as production, pipe lines, refineries, tank cars, etc., into one holding company.
3. To aid in the division of interest of a syndicate which has acquired production as a partnership.
4. To provide additional capital, the necessity for which may be brought about by the need of drilling numerous offset wells, or the temporary necessity of unusual expenditures over and above the usual working capital.
5. To accomplish the sale of a part of a property to persons who do not care to manage it themselves.

The following are the most common forms of obligations issued:

Notes.
Bonds.
Preferred stock.
Common stock of stated or no par value.
Trust certificates.
Royalty and acreage units.

There are three ends to be gained by such incorporation:

1. Liability of individual stockholders is limited.
2. Property is put under certain obligations, so that it may be divided into small salable units in marketable forms, readily accessible to the public, for raising additional capital, while the original owners need not relinquish control.
3. The individuals who have brought the properties together, or

the underwriters, are enabled to take their share of the future profits immediately, without waiting for deferred earnings.

In general, enough stock is issued to satisfy three fundamental requirements:

1. To pay for the properties included in the company. This may be preferred stock with a guaranteed interest from earnings, which may or may not be retired from the same source. It frequently carries with it a bonus of common stock. On the other hand, common stock alone, or preferred and common may go for the property and preferred for the new money contributed.

2. To pay the promoters and underwriters profits and fees. This is usually common stock and varies in amount with the type of service rendered and the marketability of the stock without this service. That is to say, the promoters and underwriters frequently take all they can, the sole limit being that the company must not be so heavily capitalized that reasonable earnings (present or future) cannot be expected to pay fair returns to purchasers of said stock. This promoters' share is usually proportionately less when the stock is taken by a small group and not offered to the public, and proportionately more where advertising or extensive soliciting is contemplated.

3. To leave enough stock in the treasury for later issues, to pay for additional properties which may be acquired later. This should be a fairly large block, as emergencies, which necessitate large amounts of additional capital, frequently arise in the oil business. Such emergencies include drilling offset wells while the field is flush, building tankage for storing oil to await a market or better prices, providing tank cars and field pipe lines, and purchasing offset properties for consolidation and more efficient operations.

The need for new capital is often met by giving, as a dividend, warrants which permit the purchase of new stock at a figure more or less below the market price, so as to ensure the raising of the money. The difference constitutes an attraction and a feasible distribution of value to stockholders without any drain on the treasury.

Instead of new stock in the old company, this offering may be stock in a subsidiary or sister company. In cases where there has been a sudden accession of large profits in one year, this device may also serve to spread out the profits, so as to avoid the concentration of the profits in one year, with the resultant inordinate tax.

When a company built up around a single group of properties sells

out its property, it is often advisable to divide the property among the stockholders in kind, and effect the sale through each stockholder, so as to avoid paying the tax in a " high bracket." If this is done, the only tax paid the government will be on the stockholders' individual incomes, which would ordinarily be in a " lower bracket." This would not apply where the company was small and the stockholders men of large incomes.

The various capital issues, such as notes, bonds, preferred and common stock, will be described solely in their application to the oil industry.

Notes and bonds are both forms of mortgage against the physical property or earnings of the company, and as such take precedence over the stock interest in any division of earnings. They are issued to cover the cost of construction of pipe lines, refineries, tank cars, etc. The type of issue depends largely upon the money market at the time.

Notes are usually shorter-term obligations. They are issued at times when it is anticipated that they can be paid off in a short time, out of earnings, or during periods of high interest which is not expected to continue.

Bonds are usually longer-term obligations, bearing a correspondingly lower rate of interest. When interest rates are high, provision is usually made for retirement or conversion into some other form of obligation.

Preferred stock is sometimes issued for the same purpose as notes or bonds, but may be of many forms. It may be given the stockholders for money advanced, with a cumulative interest rate, which must be paid before the common stock can pay dividends. It is not usually a claim against the physical property of the company, although it may be if so issued.

Common stock is essentially a right to participate in the earnings of a company, after its capital and operating charges have been met. The voting power may lie entirely in the common stock, thus giving such stockholders the right to elect all directors and, through their directors, to dictate the policy of the company. Common stock differs from preferred stock in that it has no fixed dividend rate.

Stock of no par value is a common form of issue today. Each share of such stock represents a right to a fractional part of the total earnings of the company in its proportion to the total number of shares. Thus, its intrinsic value is based upon an appraisal or estimate of the company properties and earning power at any one time. For this reason its real value varies constantly. Its main advantage is that, when

given as a bonus to the stockholders, it can only be taxed as income up to the value at time of issue. It may later increase in value, but the increase is not taxable until the stock is sold and the profit taken as cash.

In a few cases, one individual holds the property as trustee for the owners, of whom he may or may not be one. In such a case, a certificate to this effect, or an equivalent, is given by the trustee to the owners severally. This method is used where corporate ownership has important disadvantages.

An interesting form of capital issue has sprung up in recent years in the oil industry at times of boom conditions. It was frequent in the McKeesport gas pool. This is a subdivision of acreage held by a company into fractional units. These units are thus direct claims to the production from such holdings, and the owners of such units hold assignments to their fractional interest. This has the advantage of more direct participation in earnings. The disadvantages are that such a property is usually very poorly operated, and there is usually little incentive for careful operation after the units have been sold to widely scattered holders.

Owing to the constant recurrence of emergencies, as previously mentioned, it is convenient to have in reserve a considerable block of treasury stock, which can be sold for such purposes. The other alternatives are the formation of subsidiary companies, or the issuance of bonds or notes for constructive work, issued when the investment is of a more permanent type. Thus, notes may be issued for a small pipe line or refinery built to serve during the flush production of a certain pool or group of pools. Such obligations should be paid off during the early life of the property while the earnings are very high. Bonds may be most properly issued to take care of the cost of main trunk pipelines, or larger refineries at important centers of production or marketing.

CHAPTER XI

ORGANIZATION AND DEVELOPMENT OF THE PERSONNEL

An efficient, dynamic organization may be the most valuable element in a company. In fact, a company without production, but with an excellent plan for acquiring oil production, and an organization composed of individuals of high ability and reputation, has frequently been able to finance itself on this alone.

Choosing an Executive. — In choosing an executive to head an oil company, a number of factors present themselves for consideration, among which are the following:

1. Training and experience.
2. Acquaintance and personal connections in the oil industry.
3. Reliability or dependability.
4. Judgment in taking chances.
5. Organizing ability.
6. Honesty.
7. Family relations.
8. Capacity for taking responsibility.

Past training and experience is a particularly necessary qualification in the oil business, as this business differs so markedly from all other lines of industry. The operations of mining probably offer the closest parallel to those of the producing end of the oil business. At the same time, as in all other human affairs, training, ability, energy, and general intelligence will balance many years of past experience.

Another by-product of a considerable past experience lies in the number of acquaintances made and the personal connections built up. In an industry where cooperation in the field is so prevalent and necessary, these personal connections are an invaluable asset. In fact, they are the principal one possessed by certain successful individuals in the oil-producing business.

Thus, personality plays an important part in the qualifications of an oil-company executive. His ability to talk with the men in the field and to deal with them successfully and on friendly terms are

particularly important in an industry where such contacts are so much more frequent than in other industries.

In proportion as the company grows, or as its operations become more widespread, the details must be left more and more to subordinates, and the executive must have, as in all other industries, a high degree of organizing ability. He should not build so much for machine-like efficiency, as is the tendency in manufacturing plants, but should aim to build a dynamic organization with ability both to meet and to anticipate the emergencies which so often arise.

A company which is building for future production, where competition is keen, must not only be among the first to have representatives on the ground, but must see that these representatives have ability to appreciate and weigh the wide differences in values. This means an ability on the part of subordinates to take responsibility intelligently, and to carry out the spirit of instructions given.

Again, as operations become widespread, the executive must depend more and more upon the information gathered by scouts and field men, as a basis upon which to act. This necessitates a careful selection of the sources of such information, and a carefully built up news-gathering system, both by the company men and by their friends.

The wide latitude thus allowed by executives to their subordinates, and the frequent opportunities offered the latter to serve their own interest against that of the company, make it necessary to insist upon the most scrupulous honesty from the top of the organization down. This is particularly true when an organization is large, and direct supervision impossible.

The extent to which individual interests may be taken cannot be left to the judgment of the subordinate. The executive must be prepared to decide as to just what is permissible and what cannot be allowed. In general, it may be said that most companies do not allow employees to own leases in any district in which the company operates. It is generally considered proper, however, for employees to own royalties, if time is not lost because of it.

The matter of putting relatives on the payroll must be decided by each executive. In general, the practice is dangerous, in that poor men may be kept in place as against better, or the usual discipline may not be enforced in the case of relatives. It is apt to hurt the morale of the company by making other employees feel that the best chances for promotion will go to such family connections. However, when loyalty can be better secured in this way, and undue favoritism is avoided, there should be no hesitation.

Scope Given Department Heads. — Where the home office of an oil company is far removed from the field of operations, more authority must be delegated to department heads. The less such heads are burdened with the obligation of making unnecessary reports and obtaining approval for their acts, the more attention they can give to the real business of producing oil. One of the largest foreign interests operating in the past in the United States insisted, to too great a degree, upon all matters of any magnitude being referred to the home office for decision. As a result, the lost motion and time involved in this reference has slowed up operations to such an extent that the American subsidiary of this company has been greatly handicapped and rendered less aggressive. There has been a partially compensating advantage in that relatively few bad purchases have been made.

Assuming that good men have been chosen as department heads, they should be given freedom of decision in a wide field, subject only to revision of policy from time to time. The heads of departments should usually be older men, with young and active subordinates.

The heads of the various departments should be in such close touch with one another that when purchases, sales, or important changes in operation come up for decision, the combined judgment of the departments concerned is quickly available.

The Empire Gas and Fuel Company at one time had a form upon which was entered a digest of the case under consideration. This was passed on from officer to officer on the list, each one entering his comment or pertinent data from his office; the final action was taken in a joint conference called for that purpose, if the matter was of sufficient importance.

A clear understanding as to the scope of each man's work is, of course, necessary, to avoid conflict. For this purpose a graphic chart of the entire organization can be posted in each department, and copies filed at the home office. This, of course, is subject to revision.

An organization chart of a well-organized company, showing only the main subdivisions, is shown herewith (Fig. 3).

Charts showing the present organization of various other large oil companies are also given (Figs. 4–9).

It sometimes happens that, as promotions are made, an individual charged with certain duties may be moved up and made an official of the company. In addition to his new duties, he may still retain oversight of his old department. Thus it is common practice for a large company to have a number of vice-presidents, who have been pro-

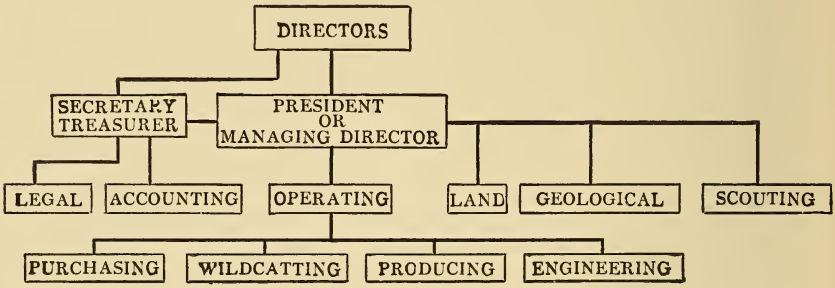

DIRECTORS
SECRETARY TREASURER
PRESIDENT OR MANAGING DIRECTOR
LEGAL
ACCOUNTING
OPERATING
LAND
GEOLOGICAL
SCOUTING
PURCHASING
WILDCATTING
PRODUCING
ENGINEERING

Fig. 3.

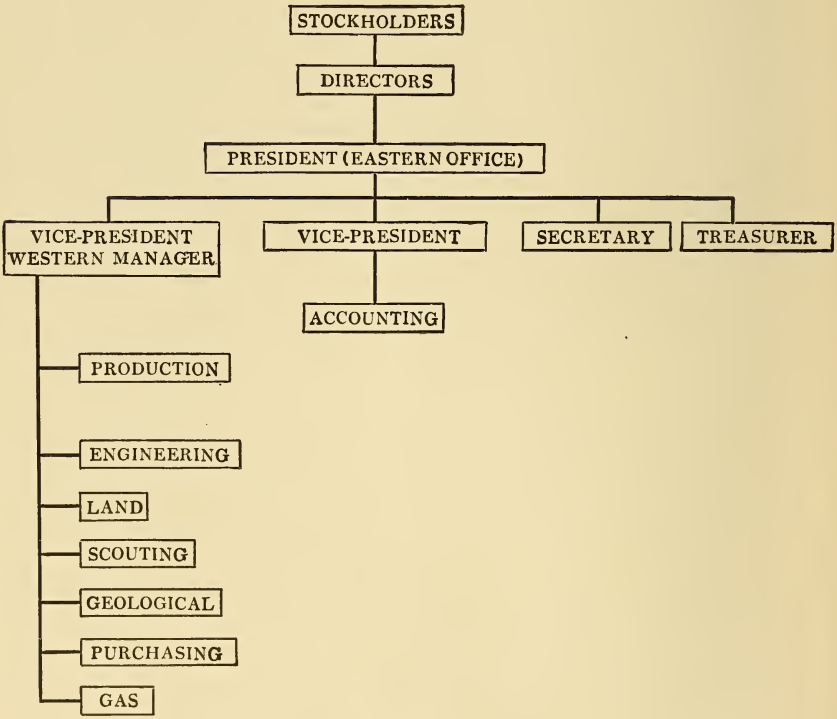

STOCKHOLDERS
DIRECTORS
PRESIDENT (EASTERN OFFICE)
VICE-PRESIDENT WESTERN MANAGER
VICE-PRESIDENT
SECRETARY
TREASURER
ACCOUNTING
PRODUCTION
ENGINEERING
LAND
SCOUTING
GEOLOGICAL
PURCHASING
GAS

Fig. 4.

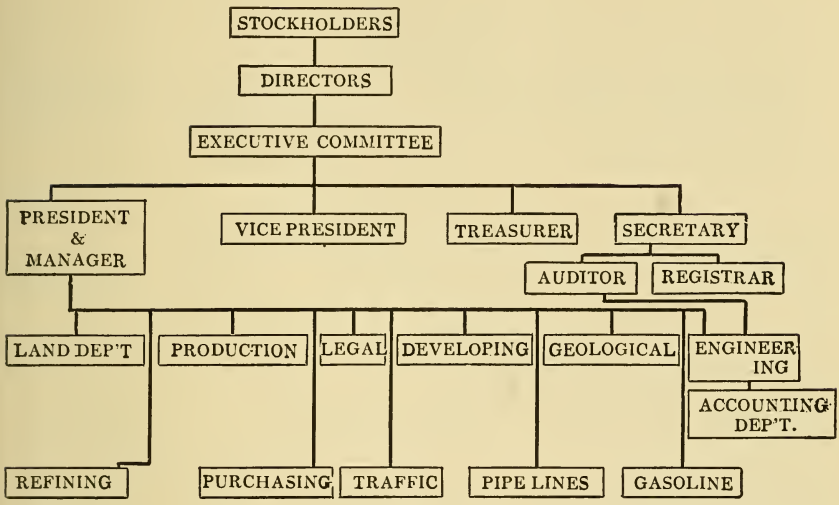

STOCKHOLDERS
DIRECTORS
EXECUTIVE COMMITTEE
PRESIDENT & MANAGER
VICE PRESIDENT
TREASURER
SECRETARY
AUDITOR
REGISTRAR
LAND DEP'T
PRODUCTION
LEGAL
DEVELOPING
GEOLOGICAL
ENGINEERING
ACCOUNTING DEP'T.
REFINING
PURCHASING
TRAFFIC
PIPE LINES
GASOLINE

Fig. 5.

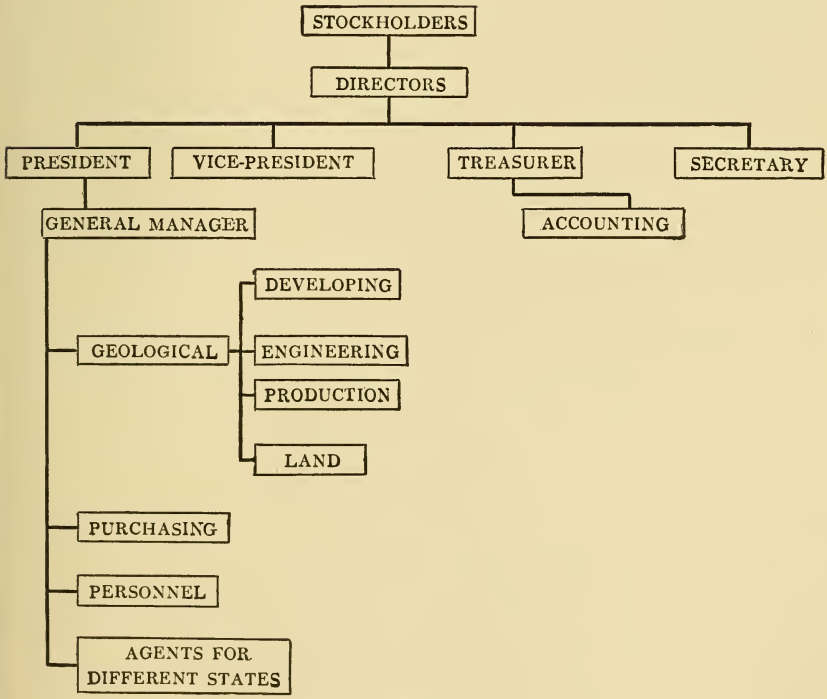

STOCKHOLDERS
DIRECTORS
PRESIDENT
VICE-PRESIDENT
TREASURER
SECRETARY
GENERAL MANAGER
ACCOUNTING
DEVELOPING
GEOLOGICAL
ENGINEERING
PRODUCTION
LAND
PURCHASING
PERSONNEL
AGENTS FOR DIFFERENT STATES

Fig. 6.

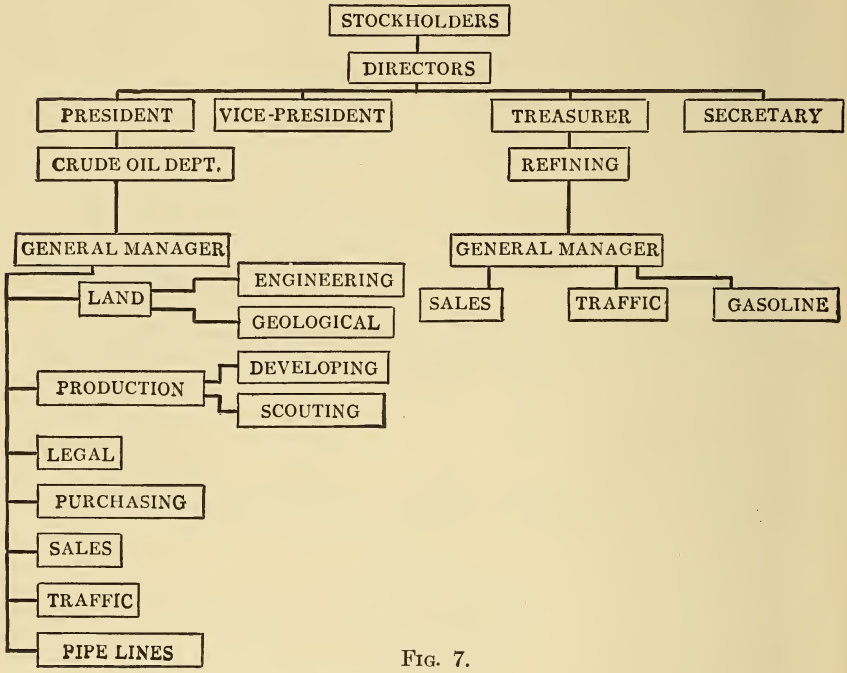

STOCKHOLDERS
DIRECTORS
PRESIDENT
VICE-PRESIDENT
TREASURER
SECRETARY
CRUDE OIL DEPT.
REFINING
GENERAL MANAGER
GENERAL MANAGER
LAND
ENGINEERING
GEOLOGICAL
SALES
TRAFFIC
GASOLINE
PRODUCTION
DEVELOPING
SCOUTING
LEGAL
PURCHASING
SALES
TRAFFIC
PIPE LINES

FIG. 7.

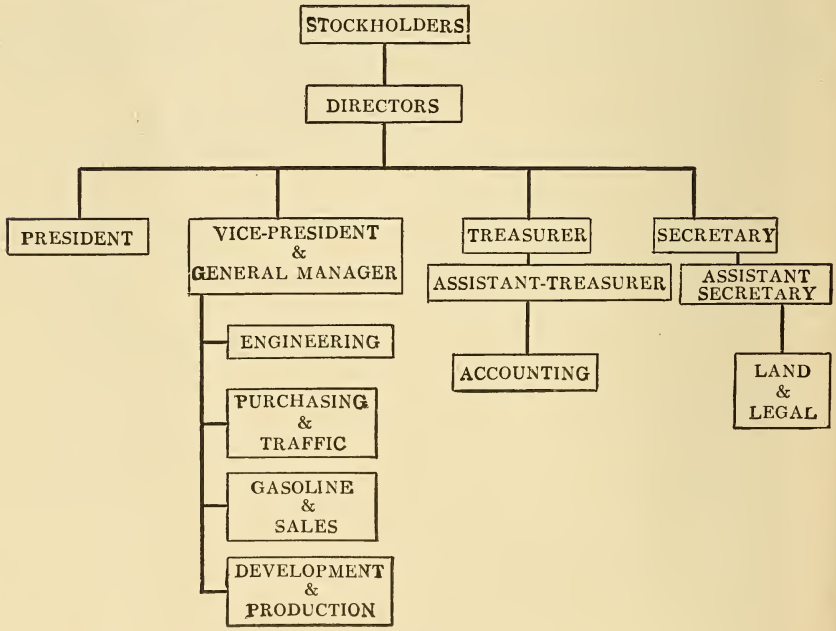

STOCKHOLDERS
DIRECTORS
PRESIDENT
VICE-PRESIDENT & GENERAL MANAGER
TREASURER
SECRETARY
ASSISTANT-TREASURER
ASSISTANT SECRETARY
ENGINEERING
ACCOUNTING
LAND & LEGAL
PURCHASING & TRAFFIC
GASOLINE & SALES
DEVELOPMENT & PRODUCTION

FIG. 8.

moted from the ranks. Each vice-president retains direct oversight of that part of the work of the organization with which he is most familiar. This division of responsibility may be on a basis of territory or kind of work. Thus, one vice-president may be assigned to the Gulf Coast,

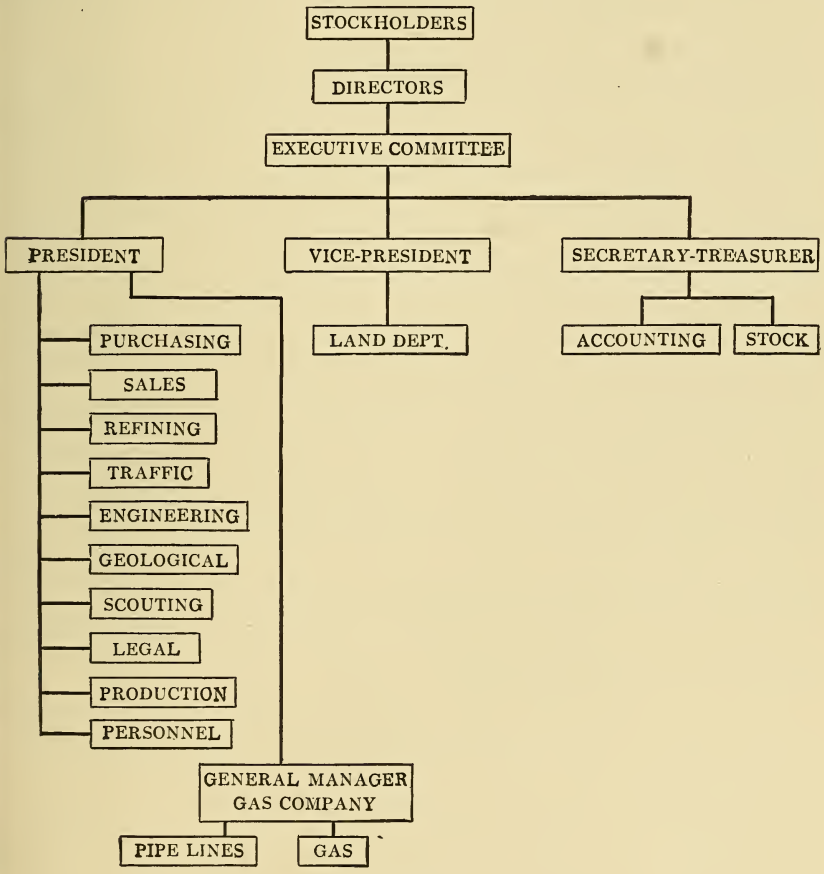


Fig. 9.

another to the Mid-Continent, still another to the Wyoming field. In another company, one man may have charge of pipe lines, one of production, and one of the legal department.

No one form of organization is best. The form must be built up according to the history and policy of the company, the field in which the company is operating, and especially the training, experience and

individuality of the officials. In a smaller company, of course, each individual must cover more ground in detail.

Assuming a well-thought-out plan of organization, the most valuable asset is a spirit of perfect co-operation. Anything which tends to hamper such a spirit should be eliminated. This may be a recalcitrant individual, a cumbersome system of reports, or lack of attention upon the part of executives to suggestions made.

It may be advisable to hold frequent meetings, to take up matters of policy, to discuss matters of general interest, and to receive suggestions. Final decision should always remain with one responsible head, as no committee can function with the same efficiency as an individual executive with sufficient power. This is particularly true of the purchaser of supplies. Supplies can be bought to the best advantage by a general purchasing agent for all departments.

Friction frequently develops between the land and the geological departments. This is best met by causing both to function under one responsible head, who may be either the geologist, if his ability and experience are broad enough, or an efficient land man, if one can be found who is sufficiently scientific in his viewpoint to make full and proper use of his geological department. The appraisal work belongs here rather than with the accounting department, as the problem is highly technical and requires the service of the geologist. Since a company's success depends mainly on the choice of leases taken and properties purchased, the head of the land department, in this large sense, holds the second most important position in the company. If the manager is a specialist in this field, the department may come directly under him, as is the case in a few companies.

The scope of the engineering department differs with the functions of each company. In a large, well-integrated company the engineering department must oversee all construction, run land lines for the land department, and often furnish instrument-men to co-operate with the geological department. More recently, company engineers have been obliged to co-operate with the accounting and geological departments in the computation of depletion and tax returns to the government.

In a strictly producing company, the engineering department may well be subsidiary to the land and geological department; but in integrated companies its diverse activities raise it to the status of a separate department. In a few cases it may even include the geological department, but this is not desirable. The status of such a depart-

ment must inevitably depend somewhat upon the caliber and training of its head.

Compensation. — Good men should be secured for all positions, even at some advance over the customary remuneration. The salary should be determined by the following considerations:

1. Value of the individual's services to the company.
2. Ability of company to pay.
3. Ability (of executive) to keep down expense without loss of disproportionate efficiency.
4. Opportunity that the company can offer for promotion or greater compensation.
5. Men available in view of the particular company's limitations.

The maximum results with the minimum expenditure is the end aimed at, although this may be gained in many ways. Too close paring of salaries and wages at one time may reduce efficiency later.

An executive's compensation may consist of one or several of a number of elements, such as the following:

1. Salary.
2. Contingent stock interest.
3. Outside interests within limits, or freedom of time for such personal interests.
4. Prestige of the position, or reputation gained through successful administration.
5. Experience and information which he may reasonably hope will lead to future advantage by offers elsewhere or advances to meet such offers.
6. Personal interest in certain properties operated by the company.

Replacement of Executives. — One of the most valuable assets of a company is what has been called its " going concern " value. This means the combination of its up-to-the-minute information plus its organization, by which it can meet a situation more quickly and efficiently than a newcomer in the field.

This value can be very much lessened by the loss of important executives at critical times. For this reason, each executive should have an understudy within the organization, who can carry on his work at short notice. A system of selective promotion from the ranks improves the morale, and at the same time makes less likely a too independent atti-

tude on the part of department heads, or a tendency to play officers' interests against the company.

The alternative to such a system is to bring in an outsider occasionally, to replace a retiring executive. This is known as " bringing in new blood " and is necessary where there is no subordinate worthy of promotion. It often tends to freshen and strengthen the policy of the company with new ideas and aggressive tactics. When expansion necessitates a new department, with a new head, it is usually better to take someone already skilled in that field and hence outside the company.

The advantages and disadvantages must be considered in each case, in order that the organization as a whole may continue to run as smoothly as possible.

Expense of Organization. — The expense of the company organization should be adjusted to its income and the potential value of the properties. During the preliminary constructive period it may be excessive if measured in terms of income, but the excess may be justified by the company's policy in acquiring new properties.

Also, during periods of business depression, the expense of the organization cannot be cut down in the same ratio as its earnings, without destroying its morale and leaving the company in poor shape to cope with the succeeding period of activity. This is a question which must be considered carefully before cutting too deeply, for it means destroying some of the " going concern " value of the organization for the sake of mere present economy.

Expert Services. — The necessity sometimes arises for various forms of investigation requiring special expert services. These may be grouped under the following heads:

1. Legal.
2. Geological or chemical.
3. Taxation.

This work may perhaps call for greater speed or more highly specialized knowledge than that possessed by the permanent staff of a company. In some cases, while the permanent staff may be competent to do such work if given the time and facilities, the immediate necessity for results may make it advisable to call in outside help. This is especially true in the legal department, where the regular force is occasionally supplemented.

A more recent use for expert services has arisen with the increased application of geology in the oil fields. While a company is using the

full time of its entire geological staff in the regions where it is operating, a property may suddenly be presented for purchase in an unknown district. In that district there may be a consulting geologist with an intensive knowledge of local conditions, and his services, while relatively high-priced on a per diem basis, may still be economical, in the long run, for any one of the following reasons:

1. Organization men are not taken away from pressing routine work.
2. No time is wasted in familiarizing organization men with general conditions in a new field. The local consultant already has these general conditions in mind, with a highly specialized knowledge of that particular field. The only extra data necessary for him would be those pertaining directly to the property in question.
3. By using such help, as needed, the company can keep a smaller staff of routine men, as the specialist is only hired for short periods.

Of course, the reputation and personal probity of such men should be carefully investigated before they are employed.

In recent years, the matter of governmental taxation has necessitated an immense amount of appraisal work on the part of all companies. Except in a few cases, none of them have been in a position to make up their own returns to the government with full confidence that they would be accepted, or that full advantage had been taken of the permissible deductions in the company's favor. These conditions have led the companies to employ various consulting engineers who are especially familiar with such problems and with the law. The engineer may be called in merely as a consultant, to advise the company's staff as to methods and forms; or he may put in his own staff temporarily, to work up all the data for tax returns. The latter procedure has been found to be the most satisfactory, in the long run, for the average company. However, as time goes on and the legal features become more generally understood and stabilized, the more efficient among the large companies will undoubtedly train their own staffs to handle this work.

The relative advisability of doing tax work within the organization, or having it done by experts, is a question which will be decided on a basis of relative economy of time and money spent for results. It is no doubt true that certain firms of consulting tax experts can continue to do this work more cheaply and to better advantage, and can save more money for the client, than the client himself can reasonably hope to do with his own organization. One very important factor in such

ability is the close contact which the consultant maintains with the governmental bureaus in Washington, and which cannot be maintained by a special interest. In fact, Government men from the bureaus in Washington frequently ally themselves with such firms of consultants upon leaving the Government service.

Finally, a company may consider entering one of the allied branches of the industry, with which the executives are only partly familiar. Experts may be called in to report upon construction and operating costs, local competition, markets, probable profits, etc. For example, a producing company would probably need such a report before building a refinery.

CHAPTER XII

THE OIL COMPANY PROSPECTUS[1]

The prospective oil investor usually learns about an oil company from a prospectus, an advertisement in a periodical, an annual report, a salesman, or an associate who in turn has learned about the company in one of these ways. If a salesman has been the instrument, he will ordinarily supplement his appeal with a prospectus. The advertisement must be so brief and of such a character that it will lead the reader to make additional inquiries concerning the company. This commonly means securing a prospectus or annual report. It is the purpose of this chapter to point out the special features which the reader should look for in an oil company prospectus, and which the writer of the prospectus should therefore furnish.

The company may be started with the purchase of producing wells or it may plan to develop new lands. Where there are producing wells the prospectus should give a map drawn to scale, showing the relation of these wells to each other, the boundaries of the leases, the dry holes both on and off the property, and the other producing wells, if any, in that pool. The depth, date of completion, and thickness of the sand for each well should be given, together with the monthly production for each lease and the number of wells producing during each month.

One of the most glaring and common faults is the exaggeration of the number of wells yet to be drilled on each lease. The number of acres allowed for each well varies with the cost of each and with the expected yield; but unless the wells are less than 1000 feet deep, it is best not to have more than one well to every $6\frac{1}{2}$ acres. Ten acres to the well is closer to the ideal for the average combination of cost and yield, and this generous spacing may be attained if the lease is so large that prospective drilling along the boundaries does not necessitate a greater number of wells.

The fact that a part of a lease is productive by no means indicates that it will all be productive. Indeed, it is often the "edge" lease

[1] Reprinted, with revision, from the New York Evening Post Oil Industry Supplement, August 31, 1918.

that is somewhat problematic, and this is the very one that is frequently the basis for the formation of a new company. The producer need not wait to drill dry holes before he grows skeptical of the productivity of the undrilled portion of his property. He frequently knows that he is approaching the edge of productive territory, because the well records show either progressive thinning or interbedding of the oil sand with shale, or reduction of porosity in a given direction.

Another common error in many a prospectus is the assumption that the new wells that are to be found on a partly developed lease will have as high an initial production as those already drilled. There are two reasons why this is not ordinarily so: First, there is a loss of pressure through the earlier wells, so that when the later wells are opened there is no longer the strong pressure requisite for a large well. Except in unusual pools, one may say that after the pool or even a lease is half drilled, later wells can no more than suffice to make up for the decline in the earlier wells, and will often fail to do even that. As an instance, the Deaner, Oklahoma, pool nearly reached its highest point when only 66 of its wells had been drilled, although it later had 104 wells, and there are probably more to be drilled. Secondly, more frequently than not, the drilling of wells is hurried in the richest parts of the pools and the poorer portions are left till later. Thus, the late wells in any pool are generally located in an inferior, fringing zone around the earlier drilled portion. Of course, the discovery well is sometimes a poor "edge" well, but development soon directs activity to the richer center, so that the rule applies even in such cases.

The prospectus should discuss the possibilities of a deeper sand that may be discovered later, as well as lower sands that may be developed on undrilled portions of the leases. Where an anticline is producing from a shallow sand, chances of a rich, deep sand are sometimes of great importance. The Cushing, Garber, Mexia, Salt Creek and Eldorado, Kans. fields are examples where this has proved to be the case. Indeed, in the case of Salt Creek there is still an excellent chance of still deeper sands.

The quality, price, and marketing facilities of the oil, or the expected oil, should be given consideration in the prospectus. Sometimes it is admitted that the oil is heavy, but the claim is made that it has extraordinary value as a lubricant. Such a statement should be taken with great skepticism, as only rarely have such claims actually been justified in the price eventually realized for the oil.

Where the prospectus makes much of the high gasoline content of

the oil, the reader should bear in mind that, in general, wells are smaller where the oil is very light. In general, a well that has the average gravity for its general district in the sand in question is likely to be larger than if the oil were either lighter or heavier.

The rate of decline in the production of oil wells is greater than is popularly supposed. Hence, to lay great stress on present earnings is unfair. In the case of the McKeesport gas boom of 1919, although gas has produced fewer booms than oil, an investment exceeding $20,000,000 produced a product of only $2,750,000. It was this practice that led to the absurd overvaluations in some of the Towanda, Oklahoma, royalties, where some of the units sold consisted of 1/60,000 of a 1/6 interest of a 1/8 royalty of 80 acres. Especially before investing in royalties, should the investor inform himself of the rate of decline to be expected in the class of properties in question. In fact, this factor alone usually determines the success or failure of the investment.

Passing now to the data which should be presented in respect to undeveloped leases — and this applies in part to the undeveloped portions of leases partly developed — the prospectus should contain a complete list of the leases, giving in tabular form the acreage, length of term, royalty, rental date, and date when the first rental is due. The location of the best favored leases should also be shown on a map, which should indicate by contours the geological structure of the region, if this is public or already in the hands of competitors. The text should state the depths to the horizons from which production is expected, and the reasons for believing that production may be found at such horizons.

Financial data should include the amount of stock outstanding, an inventory of any cash on hand or property other than the developed or undeveloped properties, and the amount of stock being offered and at what rate, also the amount held as treasury stock, if any.

A complication in buying stock in a company is that the investor is not merely buying a share in a definite property, but is also buying a share in such properties as the management may later buy or develop. The prospectus must therefore give the personnel of the directorate and officers, and should outline their policy. The investor should also remember that, in the oil business especially, the management should be in the hands of specialists; therefore the interested investor should not be greatly impressed by the names of prominent bankers, farmers, or miners in the directorate or on the list of officers. Many such locally prominent people have had no better judgment than to actually buy, as a speculation, subdivisions of leases twenty feet square. This

is an ancient swindle and has become a joke among oil men, but is still perpetrated at intervals.

On the other hand, while ill-advised purchases or development on the part of the management may ruin a hitherto promising company, a really efficient company has an important value as a going concern. Its widely distributed staff gathers information that is collectively of great value, and landowners are constantly bringing their offers to such an organization.

Any one oil lease, unless it be of a very unusual character, has too short a career to constitute the property base for an oil company. The best profits must be expected in the company which keeps on hand an adequate reserve of promising undrilled lands and which acquires more leases as these areas are developed. In fact, if the company owns a refinery, its needs demand such a continuation policy. In these then, all the more, must the investor be influenced by considerations of the efficiency of the personnel. This efficiency cannot be measured by the financial status of the company at any one particular time.

Since the productive leases will soon decline, it follows that the investor, when examining the prospectus or the annual reports of oil companies for a choice of investment, should consider the reserves of leases on hand as second in importance only to the producing property on hand. It is the quality, rather than the mere quantity, of leases that must be considered. The heavy burden of annual rentals on an extensive but ill-chosen reserve can ruin even a strong company.

The reader of the prospectus may properly feel alienated by devices generally characteristic of lurid stock promotion and not based on sound practice. One such method is offering stock at absurdly small par values. There can be no sound reason for par values of less than $10 per share in any oil company, because the very small investor who would desire less than an investment measured in $10 units cannot afford to give the amount of study required in selecting so variable a thing as an oil investment. Much space devoted to the profits that other people have made by investing in other oil stocks raises the presumption that there is a lack of merit in the present offering, since it must resort to devices not based on its own merit. Other common faults are the announcement of an advance in the offering price to take place at a set date, and the use of pictures of the large wells of other companies or of pictures of the promoters or officers, before the company has won its way. In general, appeals to feeling should repel a man who is looking for real information in the prospectus.

Where professional maps are given or professional reports are quoted, the investor will do well to discriminate as to the degree of expertness of the author cited. Where the report is paraphrased, the investor should ask to see the original report; this is also a wise plan to follow if the abstracts do not seem to be fairly selected.

The wise investor, then, should be very much more discriminating in his judgment of oil companies, and of the oil company prospectus, than he is. A critical examination of the prospectus permits the well-informed reader to winnow out those companies which are worthy of further attention from those whose success is unlikely, for a company not equipped to present a proper prospectus is presumably less well equipped to operate successfully.

CHAPTER XIII

THE ANNUAL REPORT

The board of directors annually submits a report to the stockholders. This gives in summary form a survey and statement of operations, incomes, expenditures, the state of the finances of the company and the condition of its properties at the close of the fiscal or the calendar year. This report is usually compiled with the secondary purpose of interesting potential stockholders and retaining the confidence of the present stockholders. Inasmuch as it is the only definite, official information given to the investors, the report should be a complete digest of all the leading affairs of the corporation. It is the barometer of the business and is used by the stockholders, as well as by bankers, brokers, credit men and the corporation managers.

The treatment of the information in the annual report should be clear and attractive. Many stockholders and investors have little or no training in accounting. They are unable to analyze complex financial statements, and therefore they will greatly appreciate a simple and clear report. Furthermore, as many copies of this annual report may be used to attract new investors, a further effort should be made to compile not only a clear and concise report, but one that is noticeably attractive.

The liberal use of maps, charts, graphs and even of photographs, aids materially in making the publication interesting and readable.

The annual report should give three definite kinds of information: — first, the personnel of the corporation; second, accounting reports; and third, comparative statistical data and miscellaneous reports. No set rule has been followed as to the order of presenting this material, save that the personnel data are placed at the beginning of the report.

The following outline gives a suggestive order for the arrangement of the annual report. When the accounting material precedes the comparative and miscellaneous data, the reader of the annual report is acquainted with the present and immediate condi-

tions of the corporation before noting comparisons with past periods and related subjects.

1. Personnel.
   - (*a*) Name of corporation.
   - (*b*) Address of general offices.
   - (*c*) Names and addresses of Board of Directors.
   - (*d*) The Executive Committee.
   - (*e*) Names and addresses of officers, including at least the President, Vice-President, Secretary and Treasurer.
   - (*f*) Name and address of Transfer Agent.
   - (*g*) Name and address of Registrar of Stock.
   - (*h*) Name and address of General Counsel.
   - (*i*) Names of heads of departments

2. Accounting reports.
   - (*a*) Income statement.
     - (1) Gross earnings.
     - (2) Expenses.
     - (3) Net earnings.
     - (4) Interest, taxes, etc.
     - (5) Net income.
     - (6) Dividends.
     - (7) Surplus and reserves.
   - (*b*) Statement of the surplus account.
   - (*c*) Balance sheet.
     - (1) Fixed properties with a statement of additions, depreciations, depletions and replacements.
     - (2) Inventories.
     - (3) Bonds and mortgages.
     - (4) Capital stock.

3. Comparative statistics, valuations. prospects, miscellaneous reports.
   - (*a*) Comparative income statements.
   - (*b*) Depletion and depreciation analysis.
   - (*c*) Production data.
     - (1) Oil produced.
     - (2) Royalties.
     - (3) Leases.
     - (4) Size of wells.

(5) Operations.
(6) Valuations, not necessarily complete or elaborate.
(*d*) Miscellaneous reports.

At the close of the report, certification by an accounting firm or an auditing committee, as to the correctness of the accounting statements, is usually made.

Decisions to widen the scope of the company should be stated, with the reasons. As soon as these have led to construction which can be shown by photographs, the latter should be given, if instructive. Where a company publishes a "house organ," as does the Marland Oil Company, such material can be given to the stockholders at more frequent intervals than if it were included in the annual report. For instance, one recent report contains an address by the president of the company on the building of casinghead plants and their results. Another gives a summary of the construction and operation of a new refinery, using graphs to drive home the important facts. A third shows photographs of its new pumping stations and model drilling plants to the stockholders.

(1) **Personnel Information.** — All the material needed to cover the personnel of the corporation can be placed on one page at the opening of the report. The importance of this information is obvious. These are the persons who carry the responsibility of directing and protecting the stockholders' investment. Upon them rests the final success or failure of the corporation. As one stockholder put it, when questioned about the reliability of his pet corporation, "By their personnel ye shall know them." Then he proceeded to name the leading officials, in order to impress upon his hearer the security and stability of his enterprise.

The stockholder should be able at all times to locate the general offices, the stock transfer clerks and the registrar of stock holdings, in order that he may be able to get in touch with these departments quickly, should occasion demand. To many, the annual report is the sole source of such information.

(2) **Accounting Reports.** —

(*a*) *Income statements.*

Many boards of directors are reluctant to give out detailed information regarding the sources of income and the avenues of expenditure, and the cost of printing such information would not be authorized.

The following form exhibits a typical income statement, summary in nature, giving little detailed information. It does, nevertheless, tell the important story, whether the company is making or losing money and how much. This is about all of the necessary detail that the stockholder hopes to glean from income reports.

SUMMARY INCOME STATEMENT

DEC. 31, 1921

Items	12 Mos. Ending Dec. 31, 1921	Previous 12 Mos. Ending Dec. 31, 1920	Increase	Per cent
Gross earnings.....				
Depreciation and Depletion Reserve.....				
Expenses.....				
Net Earnings.....				
Interest, Taxes, Etc.....				
Net Income.....				
Dividends { Preferred				
Dividends { Common				
Carried to Surplus.....				

The above summary is drawn from the detailed and complete profit and loss statement, which is one of the two reports that the accounting department compiles annually. Although it is not a common practice to give the detailed profit and loss statement in the annual report, the inclusion is becoming more frequent. The following is an illustration of a profit and loss statement in complete form:

PROFIT AND LOSS STATEMENT — ADVANCE OIL COMPANY

For year ending December 31, 1921.

Gross Income

Total Oil Sales (less any royalties*) $.....

Production Costs

Drilling..... $.....

Labor, Teaming and Freight..... .....

Superintendence..... .....

* The royalties are usually paid direct to the landowners by the company purchasing the oil and so do not appear on the books of the producing company.

Miscellaneous	.....	
Total Production Costs	$.....	
Operating Costs		
Maintenance and Repairs	$.....	
Wages	.....	
Pumping	.....	
Cleaning	.....	
Depreciation on Buildings and Equipment	.....	
Depletion	.....	
Royalties	.....	
Extraordinary Losses and Expenses	.....	
Teaming	.....	
Miscellaneous Expenses	.....	
Total Operating Costs	$.....	
Total Production and Operating Costs	$.....	
Inventory Adjustment		
Crude Oil Inventory.		
Jan. 1, 1920		$.....
Dec. 31, 1920		.....
Add the Decrease in Inventory		.....
Cost of Oil sold		$.....
Gross Profit		
Administration Costs		
Office Salaries		$.....
Stationery and Supplies		.....
Postage, Telephone and Telegraph		.....
Depreciation-Office Equipment		.....
Light and Heat-General Office		.....
Miscellaneous Office Expense		.....
Total Administration Costs		$.....
Prime Operating Profit		$.....
Other Income		
Purchase Discounts		$.....
Interest Received		.....
Total Other Income		$.....
		$.....
Charges to Income		
Federal Taxes		$.....
Bad Debts		.....

Sales Discounts	.....
Total Charges to Income	$.....
Net Profit for Year	.....
	$.....

(*b*) *The surplus account — its analysis.*

Probably there is no more important information which marks the stability of corporate activities than the condition of the surplus account. The surplus account shows the extent to which the assets exceed the liabilities and stock investment. In reality, it is a financial reservoir which supplies the corporation through possible dry seasons, as it were.

Therefore, if the report shows the condition of the surplus account for a period of years, the stockholder and investor have an excellent opportunity to measure the true health of the corporation.

The following surplus statement, taken from an annual report, is an excellent example of the method of treatment:

Undivided Surplus of the A Company since Jan. 1st 1915

Surplus Provided in Organization (Capital Surplus)	.....
Add:	
Balance of Surplus accumulated since Jan. 1, 1915. (Earned Surplus) to Jan. 1, 1921	.....
Income Statement	.....
Total Earned Surplus	.....
Total Undivided Surplus Jan. 1, 1922	.....

(*c*) *Balance sheet.*

A careful study of the above statement shows that the addition to the surplus for the current year is the final balance of the net income taken from the income statement. If brief, the treatment of the surplus follows as a natural sequence from the income statement. Net income is surplus created during the last year, while total surplus records all net incomes since organization, less, of course, tappings of surplus that may have occurred.

The next step is from the surplus account to the balance sheet. The balance sheet portrays all the assets arranged according to definite groupings. It also shows the liabilities to creditors, stock responsibilities to the investors and any surplus and reserves over and above the liabilities to creditors, and the stock responsibility. Thus, the balance sheet is a cross-section of the business at a given date, show-

ing the property values on one side, and the rights to such property values, as liabilities, stock, surplus and reserves, on the other side. In other words, the balance sheet shows property values balanced by property rights.

The balance sheet, being an analysis of property values, may well show the amount set aside for covering depreciations and depletion. If it is deemed advisable, supplementary statements may be placed in the annual report covering an analysis of these property values. Such reports, showing details concerning wells or leases, the amount and extent of depletion, detailed valuations, and itemized inventories, are typical statements that may be used to supplement balance sheet items.

On the liability side also, supplementary statements may prove valuable for publication in the annual report. The analysis of bonded indebtedness, mortgages and capital stock are suggestive items that are sometimes treated supplementarily to the entry in the balance sheet.

The following is an example of a well-arranged balance sheet:

BALANCE SHEET — ADVANCE OIL COMPANY

As of December 31, 1921.

Assets

Fixed Assets		
Operated Leaseholds		$.....
Less Reserve for Depletion		.....
		$.....
Lease and well equipment, tank cars, pipe lines and other equipment		.....
Less Reserve for Depreciation		.....
		.....
Buildings		$.....
Less Reserve for Depreciation		.....
		.....
Office Equipment		$.....
Less Reserve for Depreciation		.....
Unoperated Leases		.....
Total Fixed Assets		$.....
Current and Working Assets		
Cash	$.....	

Warehouse Inventory	.....	
Inventory of Crude Oil on hand	.....	
Notes Receivable	.....	
Accounts Receivable ..... $.....		
Less Reserve for Bad Debts		
	.....	
Total Current and Working Assets		$.....
Deferred Expense Items		
Unexpired Insurance	$.....	
Advances to Drilling Contractors	.....	
Total Deferred Expense Items		$.....
Total Assets		$.....
Liabilities		
Current Liabilities	$.....	
Notes Payable	.....	
Accounts Payable	.....	
Accrued Interest Payable	.....	
Accrued Wages Payable	.....	
Accrued Taxes Payable	.....	
		$.....
Capital Stock		
Preferred	$.....	
Common	.....	
		$.....
Surplus — Dec. 31, 1919	$.....	
Undivided Profits for year ending Dec. 31, 1921, added to surplus	.....	
	.....	
Total Liabilities		$.....

(3) **Comparative Data, Statistical and Miscellaneous Reports.** — The material that is embodied in this division lends itself to greater originality of treatment than do either of the first two divisions. The accounting data are cold facts from which definite conclusions may be drawn; but such data are solely inadequate in giving the stockholder the kind of information he wants. "How about the future of my investment?" — Such is his interrogation, and hence much care must be given to the preparation of material that will estimate the future for him. New leases and valuations, future prospects and operations should all be called to his attention, except where such publicity would be inimical to further leasing by the company. As an investor, the stockholder is as much interested in the future success of the undertaking as he is in the present income sheet, and

rightly so. Safety of investment is one of the prime factors in attracting capital into any undertaking, and safety of investment demands definite assurance of future production.

The table following is an historical and comparative productive table of an Oklahoma Company.

	1905	1906	1907	1908
Oil sold during year in barrels	16,077	217,241	331,928	391,843
Revenue for sale of Oil and Gas for year	$6,463	115,374	136,560	167,324
Wells drilled during year	9	52	21	36
Total number of wells productive at end of year	9	55	70	106
Amount invested in purchase of leases, or paid as rentals during year	$16,297	74,708	34,556	15,037
Total amount invested in leases up to the end of year	$16,297	91,005	125,561	140,598

An exhibit such as that below, showing a comparative statement for five years, will also be enlightening. This statement is of value in measuring the growth of the corporation's earning power. Attention is called to the two items appearing at the bottom of the table, items of direct interest to prospective investors.

Item	Year Ending Dec. 31, 1921	Year Ending Dec. 31, 1920	Year Ending Dec. 31, 1919	Year Ending Dec. 31, 1918	Year Ending Dec. 31, 1917
Total Gross Earnings					
Expenses					
Net Earnings					
Interest					
Net to stock					
Dividends Pref.					
Net to Com. and Surplus					
Dividends Com.					
Surplus and Reserves					
Number of Times Pref. Div. was earned					
Per cent of Earnings on Average Amt. of Com. stock outstanding					

A map showing at least the principal holdings of the company should be included.

It is customary to make the annual reports of any one company of uniform size and form from year to year. This is a great convenience in binding and filing the reports. As there are more items of letter size to be filed than any other, this size, with binding at the left, is recommended.

CHAPTER XIV

COST OF PRODUCING OIL

The cost of producing oil, if considered chronologically, would be divided as follows:

1. Cost of acquisition of the lease.
2. Cost of material equipment, which will not be consumed but which will remain as physical property.
3. Cost of drilling the well and placing the equipment in position.
4. Cost of operating the wells.
5. General expenses common to the various steps enumerated above, such as office rent.

There are, however, very good reasons for expressing the cost in such a way as to aid in distributing it to the individual barrels of oil produced.

The following subdivisions, which are not chronological ones, will therefore be substituted.

A. Lifting, or leasehold, expense (4, above).

B. Overhead (5, above)

C. Depreciation (distributed through the productive years of 2, above).

D. Depletion (distributed through the productive years of 1 and 3, above).

(*A*) **Lifting, or Leasehold, Expense.** — This is the direct cost of getting the oil out of the ground and into the lease storage tank. There are included in it such items as direct superintendence, the labor of pumpers, lease hands etc., fuel, cleaning, repairs, and maintenance expense applied to the lease. During such time as a well flows, and after work has become routine, the lifting expense is naturally very low, but increases greatly when pumping becomes necessary. Various factors, such as greater depth of the producing sand, heavier oil, or an oil with a greater tendency than usual to deposit paraffin, or any of the operating difficulties such as encroaching water, or "floating sand," will inevitably increase the lifting expenses. In-

accessibility of location also makes for higher leasehold as well as for other expenses, because of the difficulty of getting supplies, the necessity of paying higher wages, etc.

Lifting expense may be figured as the cost per well, over a given period of time, such as a month, which amount is then divided by the number of barrels of net production in that time, to obtain the cost per net barrel for that month. Once the well is reduced to pumping, the cost per well is fairly constant. On the other hand, since the production of a well decreases as time goes on, while the cost of operating each well remains approximately the same, the ratio of these, or in other words, the cost per barrel, increases as the well grows older, (Fig. 10). This change in the barrel cost is very marked, and is generally many times larger in the later life of the well than in the early years. Although in a field of small wells, such as the Appalachian, the distinction is less important, it is very important to avoid using one barrel cost for the whole life of a well.[1]

(*B*) **Overhead.** — Overhead expenses include the general and administrative expenses of a company, such as the salaries of officials and other office force, office maintenance, legal expenses, etc. This load may be distributed variously, but it is best prorated per normal net barrel of oil produced. By " normal " is meant an estimate of normal production, if on account of shutdown a lease is temporarily greatly reduced. Lifting and overhead combined comprise the running expenses of an oil property.

(*C*) **Depreciation.** — All physical property or equipment depreciates in value with the inevitable deterioration, or wear and tear, resulting from use and sometimes also from obsolescence. While the purchase of equipment is a capital investment, it must nevertheless be amortized from the income of the property by a charge based on the amount of depreciation the equipment will suffer each year until it has been paid for, in order that the company may not be impaired as a going concern.

There is no standard method of calculating the depreciation charge. One California company uses a rate of 5 per cent per annum on well equipment, and 10 per cent per annum on all other producing equipment and fixed assets.[2] The following table gives

[1] Johnson, Roswell H., and Foster, Alden W., Barrel Costs versus Well-day Costs, Bulletin American Association of Petroleum Geologists, Vol. 4, No. 3, p. 299. (1920.)

[2] Report of the Federal Trade Commission on the Pacific Coast Petroleum Industry. Part 1, p. 119. April 7, 1921.

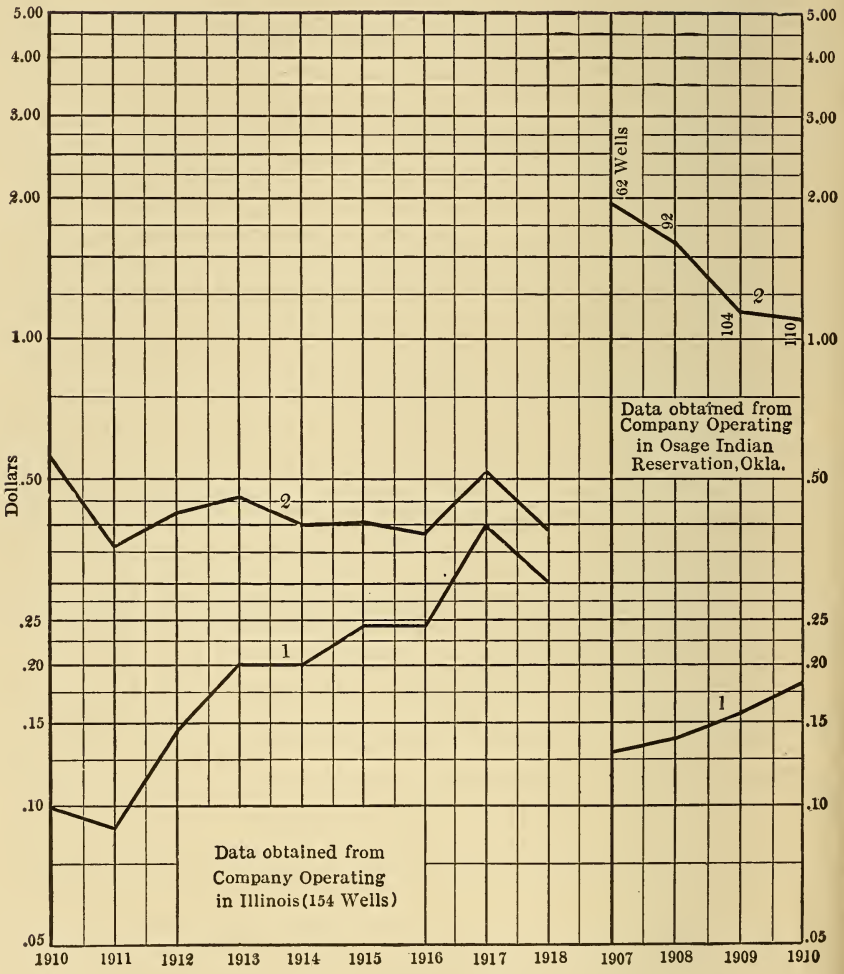


FIG. 10. Costs of operation expressed in well-day units (graph 2), and in barrel units (graph 1), for comparison.

Class	No.	Reference		Useful life	Annual depreciation
		Page		*Years*	*Per cent*
A.....	1	57	Drilling equipment	4	40–25–15–10
	2	57	Wells	.....	.....
	3	57	Dehydrators:		
			Electric	5	20
			Pipe and tanks	2	50
	4	58	Tanks:		
			Steel 5000–55,000 bbl	20	5
			2500–5000	12	8⅓
			Galvanized-iron 500–2500	12	8⅓
			Less than 500	8	12½
			Wood	5	20
			For movable tanks:		
			Galvanized-iron 500–2500	9	11⅛
			Less than 500	6	16⅔
			For water tanks:		
			500–2500	8	12½
			Less than 500	5	20
	5	58	Tools	3	33⅓
	6	58	Transportation equipment	3	33⅓
	7	58	Water plants	10	10
	8	58	Electric equipment	10	10
	9	59	Machine shops	7	14⅔
A.....	10	59	Buildings:		
			Small wood	10	10
			Frame structure	15	6⅔
			Corrugated-iron siding	6	16⅔
			Concrete	25	4
			Brick	25	4
			Steel	25	4
B.....	1	59	Pipe lines:		
			Mains over 6 inches diameter	20	4½
			Mains under 6 inches diameter	16	5⅝
			Gathering lines	10	9
			Less 10 per cent salvage.		
			Pump stations	10	10
C.....	.....	60	Tank cars	20	5
	1	60	Refineries:		
			Class 1.—Located at point assuring a long supply of crude oil; or well-constructed plants.	20	5
			Class 2.—Located at points assuring supply of crude oil for several years.	10	10
			Class 3.—Skimming plants and small refineries of poor construction, or located at points where supply of crude oil is not assured for a long period of time.	6	16⅔
D.....	1	62	Sales or marketing equipment:		
			Tankers	20	5
			Barges	5	20
			Filling stations —		
			Class A.—Ordinary wood or corrugated steel construction.	5	20
			Class B.—Brick and concrete or extraordinary construction.	10	10

Class	No.	Reference		Useful life	Annual depreciation
		Page		*Years*	*Per cent*
			Distributing stations	10	10
			Tank wagons —		
			Motor	4	25
			Horse	6	16⅔
			Steel barrels	7	14⅔
			Track and switches	8	12½
E		63	Natural gas (utility companies):		
	1		Drilling equipment. (See A–1.)		
	2		Wells. (See A–2.)		
	3		Gas pipe lines —		
			Mains	12	8½
			Gathering lines	10	10
			City lines	10	10
	4		Compressor stations	7	14⅔
	5		Gathering stations	6	16⅔
	6		Field stations	4	25
	7		Meters and regulators	5	20
			Considered as a whole plant	10	20
F	1	64	Natural gas gasoline:		
			Plant—Compression, with 20 per cent salvage value.	4	35–20–15–10
			Absorption plants, with 20 per cent salvage	4	35–20–15–10

the depreciation rates recommended by the Income Tax Unit of the U. S. Treasury Department.[1]

Depreciation may be distributed to the several years

(*a*) by the " straight-line method,"

(*b*) by one of the numerous modifications involving a recognition of interest,[2] or

(*c*) upon each barrel of oil.

In the first method, the total depreciation is distributed in equal yearly installments over the life of the property, whereas in the last, each barrel of oil produced is assigned an equal share of the depreciation. In the straight-line method the depreciation charge is smaller per barrel in the early life of the property, when the yearly revenue is distributed over a larger number of barrels, and is larger per barrel in the later life when the production is less. Therein lies the disadvantage of this method. In spite of this it is very common, because of its simplicity and the habits of accountants brought in from other industries.

[1] Manual for the Oil and Gas Industry, U. S. Treasury Department.

[2] Saliers, Earl A., Principles of Depreciation, Ronald Press Co., New York City, N. Y.

(*D*) **Depletion.** — A depletion charge is for the purpose of returning two items of capital expenditure, (*a*) costs of acquisition of properties, and (*b*) drilling costs. Within the first are included not only bonuses paid for leases, but also geological, engineering, legal and other expenses incident thereto. A large part of these latter expenses is so difficult to attribute to the respective leases that they are carried in general expense and not provided for in depletion.

Depletion may also be distributed in several ways. One extreme method is to make the depletion unit per barrel of oil so large that the property "pays out" in three or four years, after which there is no depletion charge, and the property is "on velvet." Another method is to estimate the life of the production in round numbers, such as ten, fifteen, twenty, or twenty-five years, and then distribute the total capital expenditure equally over this life. Latterly, because of the regulations of the Income Tax Unit, an estimate is made of the total ultimate production of each well, and the amount involved is distributed equally over each barrel of oil in that total (Chapter XVI). This method is difficult for small companies who do not have anyone in the staff skilled at estimating oil reserves.

Royalty. — Royalty may be treated as a cost item. More commonly the pipe line is directed to pay the royalty direct to the lessor. In this case, the revenue of the oil company consists only of the money paid by the purchasers for the net oil.

Examples of Costs — While an analysis of the cost of producing oil shows four principal items, lifting, overhead, depreciation and depletion, there is no uniform procedure among companies in following this outline, nor in including always the same charges under each head. In citing examples of costs it would not, therefore, be possible to show a uniform classification unless all citations came from the same source; where a wider range of sources is drawn upon such a classification is impossible. The following table (Fig. 11) gives

Year	Field	Net Prod. in bbls. of the company	Lifting Cost per bbl.	General expense per bbl.	Total Running cost per bbl.
1918	Appalachian	129,237	$1.26	$0.57	$1.83
1918	Oklahoma	1,236,933	0.30	0.08	0.38
1918	Osage, Oklahoma	101,907	0.37	0.63	1.00
1918	Chelsea, Oklahoma	16,622	0.33	0.19	0.52
1918	Texas Cretaceous	25,737	0.53	0.22	0.75
1918	California	464,722	0.16	0.17	0.33

FIG. 11. Producing costs in the Appalachian, Mid-Continent, Gulf Cretaceous and California fields in 1918.

specific examples of lifting and overhead costs in 1918 in the Appalachian, Mid-Continent, Gulf Cretaceous and California fields.

These, however, should not be taken as average examples.

Variations are due in part to the size of the wells, since unit costs are generally larger with smaller wells, in part to the field of operation, and in part to the number of wells per company.

Osage, Oklahoma, costs for 1921 are shown in tabular form in Fig. 12, and graphically in Fig. 13.[1]

In this table, lifting, general and overhead, and depreciation items are given.

Number of Wells	Gross production per Well per day	Production Costs per Barrel of Net Production				
		Lifting	Overhead	General	Depreciation	Total
619	6.58	0.45	0.16	0.12	0.29	1.02
151	4.57	0.51	0.15	0.19	0.26	1.11
1932	3.88	0.51	0.17	0.19	0.30	1.17
1284	2.42	0.70	0.20	0.31	0.44	1.65
1133	2.13	0.76	0.20	0.35	0.49	1.80
877	1.79	0.90	0.23	0.42	0.58	2.13
528	1.31	1.08	0.27	0.57	0.74	2.66

FIG. 12. Costs in the Osage Reservation, Oklahoma, during the first six months of 1921.

These Osage costs illustrate especially the fact that the smaller the well, the greater are the costs per barrel. They also show that while the decrease is in the lifting, depreciation and general items, the overhead expense remains about the same for wells of all sizes, and thus comprises a larger percentage of the total cost of a smaller well.

Figures 14 to 16 afford a comprehensive study of the costs of producing oil in California from 1914 to 1919.[2]

In this study, royalty is considered a cost item and total costs are therefore divided by gross, instead of by net, productions. The average royalty of the whole production varied from 6.6 per cent in 1914 to 8 per cent in 1919.

[1] National Petroleum News, Sept. 21, 1921, p. 29; and Oct. 12, 1921, p. 54. Also the Mid-Continent Year Book, 1921, pp. 42–46.

[2] From an excellent chapter in the Federal Trade Commission Report on the Pacific Coast Petroleum Industry, 1921.

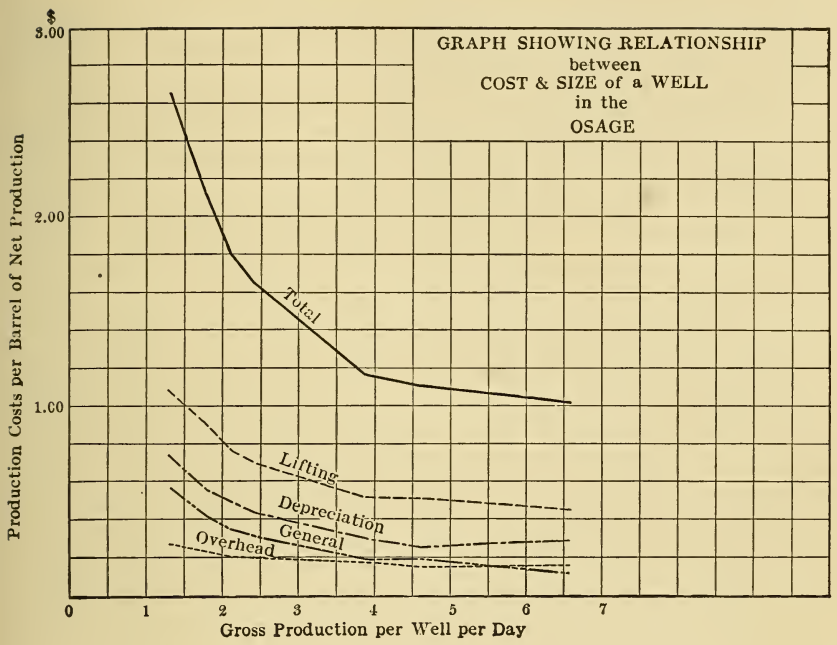


FIG. 13.

In Figure 14, costs per barrel are shown in detail. The companies whose costs are quoted are grouped according to the amount of their production, as follows:

Group 1 — Companies producing 1,000,000 bbls. or more, per year.
" 2 " " 250,000–1,000,000 bbls. per year.
" 3 " " 50,000– 250,000 bbls. per year.
" 4 " " less than 50,000 bbls. per year.

Fig. 14 shows, in addition to the amount of cost creditable to each item, the general increase in costs from 1914 to 1919. This was due not only to economic and business conditions in general, but also to a decline in the production of the average well.

Variations in the elements, as well as in the total costs, are emphasized in Fig. 15.

The fact that the smaller well costs more to operate is shown in Fig. 16,[1] by means of a graph based on the detailed figures for California companies in 1914.

[1] After table on p. 126 of Federal Trade Commission Report on Pacific Coast Petroleum Industry.

Year	Group	Number of companies	Lifting expense	General and administrative	Depreciation	Depletion	Credits[1]	Cost exclusive of royalty	Royalty	Total cost
1914	1	10	$0 049	$0.046	$0.067	$0.069	$0.004	$0.227	$0.018	$0.245
	2	18	.102	.033	.080	.049	.001	.263	.023	.286
	3	38	.171	.045	.107	.121	[2]	.444	.049	.493
	4	30	.240	.060	.183	.193	.....	.676	.045	.721
	Total	96	.068	.045	.073	.071	.004	.263	.021	.274
1915	1	7	.053	.051	.080	.077	.006	.255	.022	.277
	2	20	.088	031	.079	.053	.002	.249	.016	.265
	3	35	.141	.042	.116	.089	.001	.387	.044	.431
	4	45	.250	.111	.236	.315	[2]	.912	.069	.981
	Total	107	.071	.048	.086	.079	.005	.279	.023	.302
1916	1	9	.068	.059	.077	.080	.008	.276	.024	.300
	2	19	.116	.038	.090	.064	.002	.306	.022	.328
	3	43	.194	.059	.122	.107	.002	.480	.051	.531
	4	45	.275	.072	.224	.311	[2]	.882	.078	.960
	Total	116	.088	.056	.085	.084	.007	.306	.027	.333
1917	1	10	.090	.067	.091	.074	.013	.309	.031	.340
	2	19	.148	.044	.089	.060	.002	.339	.041	.380
	3	49	.239	.067	.140	.126	.001	.571	.051	.622
	4	53	.345	.101	.244	.305	.001	.994	.097	1.091
	Total	131	.113	.064	.097	.080	.010	.344	.035	.379
1918	1	10	.105	.084	.097	.072	.015	.343	.038	.381
	2	22	.183	.065	.105	.062	.002	.413	.056	.469
	3	47	.289	.091	.142	.108	.001	.629	.061	.690
	4	55	.431	.119	.251	.295	.003	1.093	.098	1.191
	Total	134	.134	.082	.104	.076	.012	.384	.044	.428
1919[3]	1	11	.131	.098	.101	.070	.015	.385	.040	.425
	2	22	.215	.068	.115	.059	.003	.454	.045	.499
	3	39	.325	.100	.138	.119	.001	.681	.068	.749
	4	47	.414	.136	.262	.307	.001	1.118	.094	1.212
	Total	119	.156	.095	.106	.075	.013	.419	.044	.463

[1] Deduction. [2] Less than one-tenth of 1 cent. [3] First 6 months.

FIG. 14. California costs from 1914 to 1919, grouped by size of company, per barrel of oil.

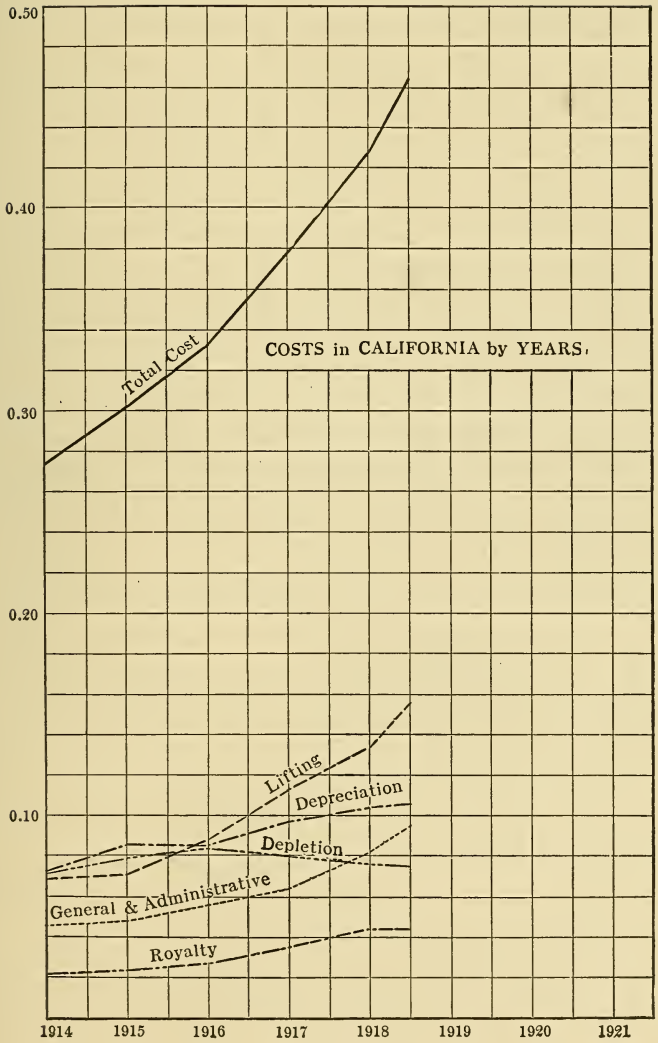

0.50
0.40
0.30
0.20
0.10
COSTS in CALIFORNIA by YEARS.
Total Cost
Lifting
Depreciation
Depletion
General & Administrative
Royalty
1914
1915
1916
1917
1918
1919
1920
1921

FIG. 15.

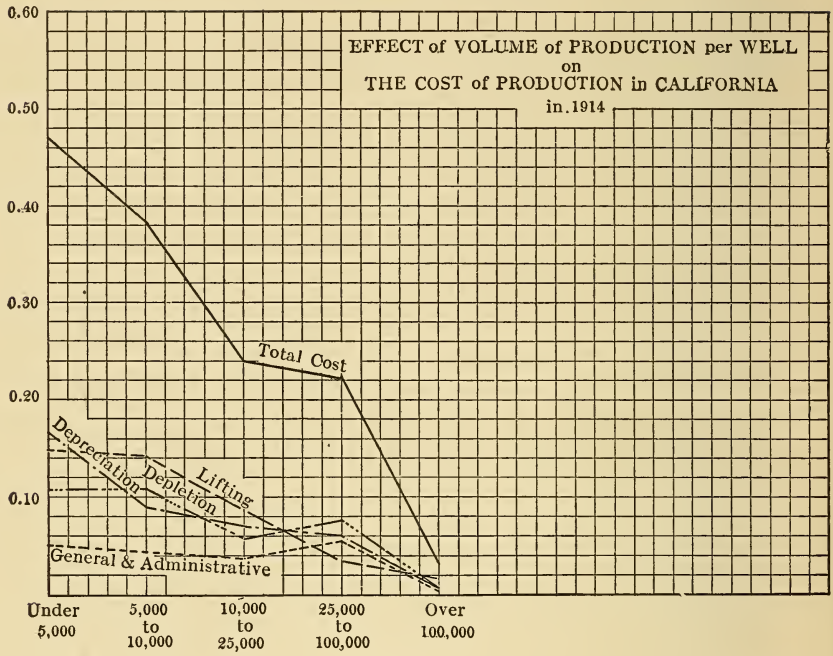

EFFECT of VOLUME of PRODUCTION per WELL
on
THE COST of PRODUCTION in CALIFORNIA
in 1914
0.60
0.50
0.40
0.30
0.20
0.10
Total Cost
Depreciation
Depletion
Lifting
General & Administrative
Under 5,000
5,000 to 10,000
10,000 to 25,000
25,000 to 100,000
Over 100,000

FIG. 16.

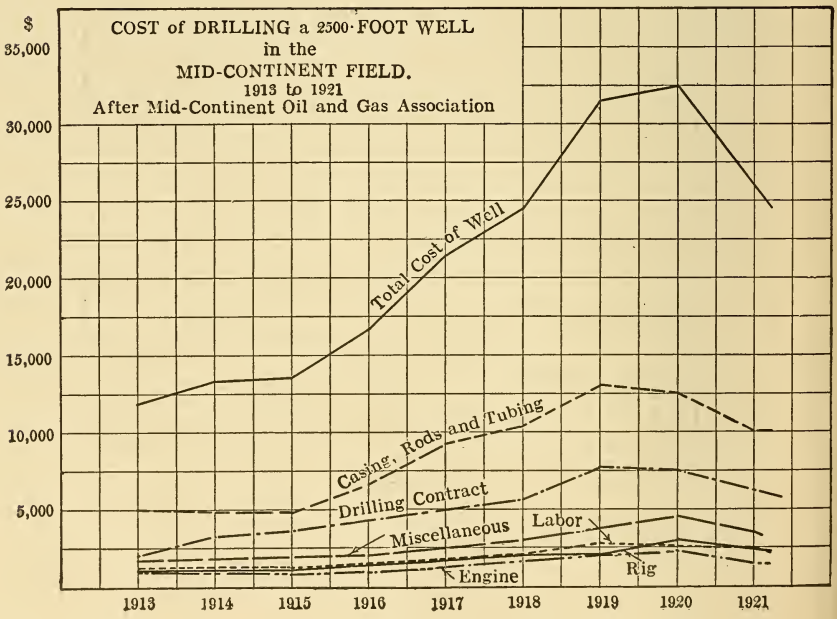

$
COST of DRILLING a 2500-FOOT WELL
in the
MID-CONTINENT FIELD.
1913 to 1921
After Mid-Continent Oil and Gas Association
35,000
30,000
25,000
20,000
15,000
10,000
5,000
Total Cost of Well
Casing, Rods and Tubing
Drilling Contract
Miscellaneous
Labor
Engine
Rig
1913
1914
1915
1916
1917
1918
1919
1920
1921

FIG. 17.

Drilling Costs. — Drilling costs are composed of elements which vary widely, not only with the depth of the well, but also with the difficulties encountered. The principal items of drilling cost are as follows:

1. Drilling rig.
2. Dril ing contract.
3. Casing.
4. Fuel and water.
5. Pumping equipment.
6. Miscellaneous labor and supplies.

The cost of the rig depends partly upon the probable depth of the well and partly upon the accessibility of the location. The cost of the drilling depends not only upon the depth, but also upon the underground difficulties that are to be expected. The cost of casing is a large item, and is subject to great variation: one well may require complete casing of the strongest type; in another, the walls of the hole may stand up well, with few water sands to be penetrated, and so may require little casing. In some cases an adequate fuel and water supply can only be secured by expensive transportation. The cost of pumping equipment depends largely upon the depth of the well, but that of incidental labor and supplies may vary greatly under different conditions.

The costs of drilling, like the costs of operating, increased greatly from 1915 to 1919 inclusive. Figure 17[1] shows changes in cost of drilling an average 2500-foot well in Oklahoma during the years 1913 to 1921, and an analysis of the components of those costs. Figure 18[2] gives changes in the costs of $6\frac{5}{8}$-inch casing and 2-inch tubing, chosen as representative materials in the equipment of a well.

Figure 19 gives changes in prices of materials and supplies in California from 1914 to 1920.

[1] After table by Mid-Continent Oil & Gas Association in National Petroleum News, February 22, 1922, p. 28.

[2] After Bates and Lasky, Statistical Review of the Mid-Continent Field, from 1912 to 1920 inclusive, National Petroleum News, March 30, 1921.

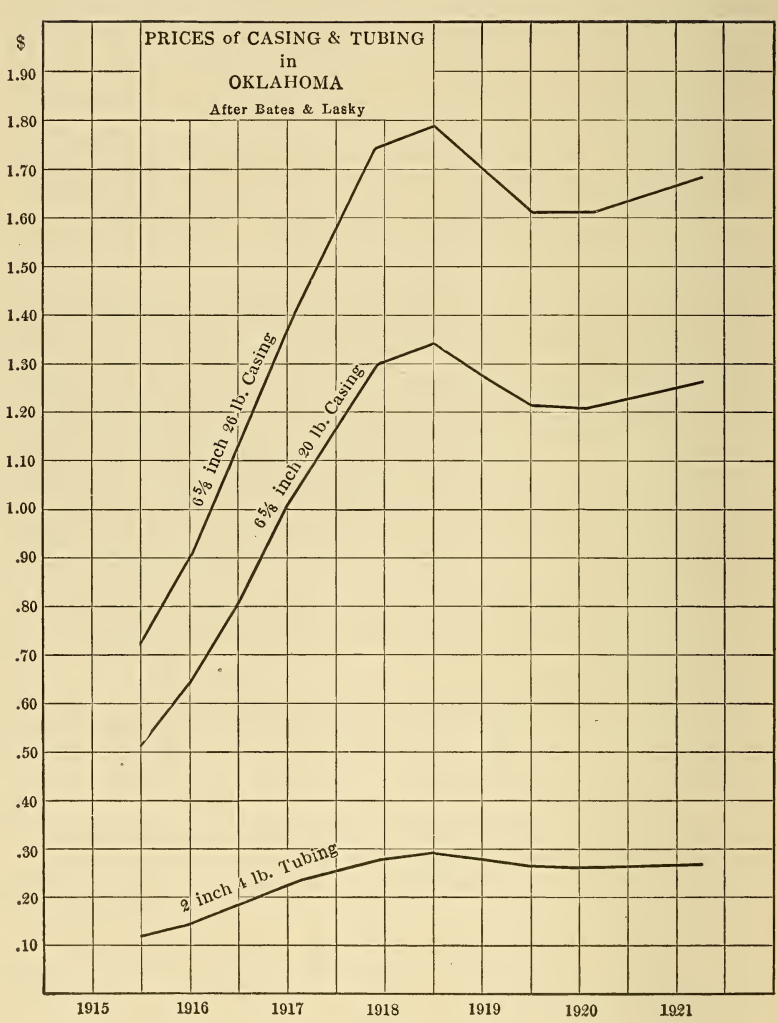

PRICES of CASING & TUBING
in
OKLAHOMA
After Bates & Lasky
$
1.90
1.80
1.70
1.60
1.50
1.40
1.30
1.20
1.10
1.00
.90
.80
.70
.60
.50
.40
.30
.20
.10
6⅝ inch 26 lb. Casing
6⅝ inch 20 lb. Casing
2 inch 4 lb. Tubing
1915
1916
1917
1918
1919
1920
1921

Fig. 18.

FIG. 19. Prices of principal materials and supplies used in drilling operations in California, July 1, 1914, to Jan. 1, 1920

Article	Delivered prices						Percentages of increase over July 1, 1914				
	July 1, 1914	July, 1 1916	July 1, 1917	July 1, 1918	July 1, 1919	Jan. 1, 1920	July 1, 1916	July 1, 1917	July 1, 1918	July 1, 1919	Jan. 1, 1920
Bit steel per pound	$0.036	$0.048	$0.07	$0.07	$0.07	$0.10	33.33	94.44	94.44	94.44	177.88
Bailers:											
5½ by 20, each	26.91	35.73	52.17	57.28	59.27	56.73	32.78	93.87	112.86	120.25	110.81
8 by 19, each	45.50	57.22	66.86	78.49	92.69	94.94	25.76	46.95	72.51	103.71	108.66
8 by 20, each	44.48	53.63	76.05	84.89	94.34	96.22	20.57	70.98	90.85	112.10	116.32
8 by 30, each	66.72	105.94	116.83	136.48	148.63	141.07	58.78	75.10	104.56	122.77	111.44
Casing:											
5 3/16-inch — 17 pounds, per foot	.557	.727	1.05	1.25	1.13	1.13	30.52	88.51	124.42	102.87	102.87
6⅝-inch — 17 pounds, per foot	.594	.752	1.06	1.26	1.14	1.14	26.60	78.45	112.12	91.92	91.92
6⅝-inch — 20 pounds, per foot	.698	.893	1.272	1.49	1.355	1.358	27.94	82.23	113.47	94.13	94.56
8¼-inch — 17½ pounds, per foot	.695	.89	1.217	1.42	1.30	1.30	28.06	75.11	104.32	87.05	87.05
8⅝-inch — 28 pounds, per foot	.988	1.315	1.843	2.14	1.955	1.943	33.10	86.54	116.60	97.87	96.66
10-inch — 35 pounds, per foot	1.203	1.577	2.21	2.60	2.37	2.37	31.09	83.71	116.13	97.01	97.01
12½-inch — 50 pounds, per foot	1.97	2.453	3.453	4.013	3.70	3.68	24.52	75.28	103.71	87.82	86.80
15½-inch — 52½ pounds, per foot	2.57	3.04	3.67	4.51	4.17	4.17	18.29	42.80	75.49	62.26	62.26
15-inch — 70 pounds, per foot	3.484	4.185	6.015	6.26	5.795	5.795	20.12	72.65	79.68	66.33	66.33
Drive pipe, 8-inch — 32 pounds, per foot	1.153	1.46	2.15	2.51	2.297	2.297	26.63	86.47	117.69	99.22	99.22
Tubing:											
2-inch — 4 pounds, per foot	.145	.19	.265	.3117	.2842	.2842	31.03	82.76	114.97	96.00	96.00
2-inch — 4½ pounds, per foot	.1608	.2108	.2992	.35	.32	.32	31.09	86.07	117.66	99.00	99.00
3-inch — 8½ pounds, per foot	.2833	.3558	.5367	.63	.5725	.5725	25.59	89.45	122.38	102.08	102.08
Line pipe, 2-inch, oil line, per foot	.12	.175	.2275	.27	.245	.245	45.83	89.58	125.00	104.17	104.17
Sucker rods, ⅞-inch, per 100 feet	14.25	15.38	19.58	20.93	18.24	20.44	7.93	37.40	46.88	28.00	43.44
Horn sockets, 6¼-inch, each	41.30	57.72	66.60	78.75	78.75	72.00	39.83	61.26	90.68	90.68	74.33
Rig irons, 5-inch, D. T. (not including rig or calf wheels)	504.33	595.55	829.77	1,079.50	1,079.50	1,120.71	18.09	64.53	114.05	114.05	122.22
Drilling stem pins, 2½ by 3½ inch	6.38	10.80	13.18	18.60	18.50	19.29	69.28	106.58	191.54	191.54	202.35

FIG. 19. Prices of principal materials and supplies used in drilling operations in California, July 1, 1914, to Jan. 1, 1920—Cont.

Article	Delivered prices						Percentages of increase over July 1, 1914				
	July 1, 1914	July 1, 1916	July 1, 1917	July 1, 1918	July 1, 1919	Jan. 1, 1920.	July 1, 1916	July 1, 1917	July 1, 1918	July 1, 1919	Jan. 1, 1920
Wire cables:											
¾-inch, 6 strands, 19 wire	$.0825	$.136	$.181	$.1833	$.1723	$.165	64.85	119.39	122.18	108.85	100.00
⅞-inch	.1085	.1721	.241	.239	.222	.2096	58.62	122.12	120.28	104.61	93.18
Manila cable, per pound	.1525	.2225	.3431	.3856	.2956	.2661	45.90	124.98	152.85	93.84	74.49
Pumps:											
3 by 2 by 3, Duplex	36.80	45.57	57.95	70.30	62.65	64.801	23.83	57.47	91.03	70.24	76.09
6 by 4 by 6, Duplex	94.13	112.68	144.33	170.64	156.31	161.80	19.71	53.33	81.28	66.06	71.89
Pump jacks, 3-inch beam, each	34.20	39.00	54.21	60.37	57.18	62.99	14.04	58.51	76.52	67.19	84.18
Rig timber, per 1000 feet	26.19	29.00	35.88	41.50	52.60	57.75	10.73	37.00	58.46	100.84	120.50
Steel tanks, 55,000 barrels, each	16,667.00	21,653.00	36,667.00	37,967.00	34,223.00	36,743.00	29.92	120.00	127.80	105.39	120.45
Gas engines:											
25-horsepower, each	750.00	826.33	902.00	988.00	1,483.33	1,344.67	10.18	20.27	31.73	97.78	79.29
40-horsepower, each	.....	900 00	1,792.75	2,195.00	2,023.33	1,956.46	.....	99.19	143.89	124.81	117.38
Steam engines:											
25-horsepower, 11 by 12	325.13	358.87	454.73	541.70	679.55	691.20	10.38	39.86	66.61	109.01	112.59
30-horsepower, 12 by 12	360.64	368.16	480.95	589.60	698.05	748.51	2.09	33.36	63.49	93.56	107.55
Boilers:											
40-horsepower	680.00	685.00	1,000.00	1,970.00	1,970.00	1,900.00	.74	47.06	189.71	189.71	179.41
50-horsepower	1,000.00	1,040.00	1,965.00	1,970.00	1,970.00	1,970.00	4.00	96.50	97.00	97.00	97.00
70-horsepower	725.00	750.00	1,250.00	1,975.00	1,975.00	1,975.00	3.45	72.41	172.41	172.41	172.41
Band wheel, Powers Mascot, No. 8	500.00	563.49	640.99	850.48	936.74	1,054.75	12.70	28.20	70.10	87.35	110.95

The following are average costs of drilling and equipping wells at the end of 1921[1].

BURBANK POOL, OSAGE COUNTY, OKLAHOMA

December, 1921

Total depth of well, 2843 feet. Standard method.	
Standard rig complete	$4,000.00
Drilling contract @ $4.50 per foot	12,793.50
Teaming material to location	2,863.00
Trucking and freight	1,384.00
Miscellaneous equipment	608.00
2248 ft. 8¼-inch casing, 28 lb.	4,518.48
2800 ft. 6⅝-inch casing, 24 lb.	4,700.00
Labor	5,365.00
Fuel	1,485.00
Water	785.00
Initial shot	550.00
Allowances for unforeseen accidents	3,000.00
Total	$42,051.98
Salvage of an oil well	3,500.00
Net cost of oil well	38,551.98
Additional salvage if dry hole	10.500.00
Net cost of dry hole	$28,051.98

OKMULGEE COUNTY, OKLAHOMA

December, 1921

Total depth of well, 2925 feet. Standard method.	
Standard rig complete	$2,500.00
Repairs to rig during drilling	350.00
Drilling contract @ $2.25 per foot	6,581.25
Roustabout labor and slush pit	500.00
Teaming 100 tons to location	850.00
55 ft. 12½-inch casing, 50 lb.	138.05
500 ft. 10-inch casing, 40 lb.	1,005.00
1900 ft. 8½-inch casing, 28 lb.	2,603.00
2400 ft. 6⅝-inch casing, 24 lb.	2,644.00
2900 ft. 5 3/16-inch casing, 17 lb.	2,241.00
250 bbl. water tank	310.00
1000 ft. 2-inch water line	227.00
1320 ft. 2-inch gas line	264.00
Water	350.00
Fuel	875.00
Shot	500.00

[1] Oil Weekly. Statistical Number. Jan. 21, 1922, p. 54.

Installation of individual pumping outfit	3,600.00
Allowances for unforeseen accidents	7,000.00
Total	$32,558.30
Salvage of an oil well	2,500.00
Net cost of an oil well	$30,058.30
Additional salvage if dry hole	11,000.00
Net cost of dry hole	19,058.30
Plugging dry hole	800.00
Total cost of dry hole	19,858.30

The following is the itemized cost of equipping a 2700-foot well for pumping in the Deaner pool, Okfuskee County, Oklahoma, in 1921.[1]

Tubing $2\frac{1}{2}$ inch, $4\frac{1}{2}$ lb., 2700 ft., @ 0.30¢	$810.00
Sucker rods $\frac{5}{8}$ inch, 2650 ft., @ $7.75 per 100 ft.	205.37
Flow tank (200 bbls.)	375.00
Two steel storage tanks (250 bbls.)	900.00
Lead lines to oil tanks, 200 ft. of 3-inch (used tubing)	60.00
Miscellaneous pumping equipment	120.00
Gas engine, installed	1,600.00
Total	$4,070.37

Other costs, as of Dec. 1921, are as follows:[2]

FOX BUSH POOL, BUTLER COUNTY, KANSAS

December, 1921

Total depth, 2800 feet. Standard method.	
Standard rig complete	$2,100.00
Repairs to rig while drilling	100.00
Drilling contract @ $2.00 per foot	5,600.00
Roustabout labor and slush pit	500.00
Teaming 122 tons of material to location	640.50
40 ft. $15\frac{1}{2}$-inch casing, 70 lb.	177.60
330 ft. $12\frac{1}{2}$-inch casing, 50 lb.	874.50
660 ft. 10-inch casing, 40 lb.	1,272.00
775 ft. 10-inch casing, 35 lb.	1,433.75
1869 ft. $8\frac{1}{4}$-inch casing, 28 lb.	2,853.60
2509 ft. $6\frac{5}{8}$-inch casing, 24 lb.	2,960.60
2769 ft. $5\frac{3}{16}$-inch casing, 17 lb.	2,319.03

[1] Kirwan, M. J. and Schwarzenbek, L. X., Petroleum Engineering in the Deaner Oil Field, Okfuskee County, Oklahoma, U. S. Bureau of Mines, July, 1921.

[2] Oil Weekly, Jan. 21, 1922, pp. 57 and 60.

One 250-bbl. water tank	245.00
500 ft. 2-inch water line @ $0.19¾ per ft.	98.75
500 ft. 2-inch gas line @ $0.17¾ per ft.	88.75
Water	147.00
Fuel	980.00
Shot	359.00
Installation individual pumping outfit (including tubing rods, engine, belt and settling)	3,199.28
Allowance for unforeseen expenses	400.00
Total	$26,349.36
Salvage of an oil well	4,957.59
Net cost of an oil well	$21,391.77
Additional salvage if dry hole	10,965.74
Cost of plugging	640.00
Net cost of dry hole	11,066.03

WICHITA COUNTY, TEXAS

December, 1921

Total depth, 500 feet. Portable rig

Slush pit	$25.00
Drilling, 500 ft. @ $1.50 per ft. with portable drilling machine furnished complete by contractor	750.00
Fuel and water	
Motor fuel for engine power	$25.00
Water service	75.00
500 ft. 6⅝-inch 17-lb. casing	425.00
Freight, hauling and miscellaneous expense	25.00
Tubing, rods, jack and miscellaneous connection necessary to hook up completed well to central power plant	200.00
Total	$1,525.00

STEPHENS AND YOUNG COUNTIES, TEXAS

December, 1921

Total depth 3400 ft. Standard method.

84 x 22 ft. sway-braced standard rig with 6-inch Ideal rig irons, California pattern	$3,000.00
Drilling 3400 ft. hole by contract @ $4.25 per ft.	14,450.00
Fuel and water	
75 days' gas at $15 per day	1,125.00
75 days' water service @ $10 per day	750.00
Freight and hauling	2,500.00
Tanks, flow lines, etc.	2,500.00

300 ft. 20-inch casing, 90 lb.	1,780.00
500 ft. 15½-inch casing, 70 lb.	2,160.00
1000 ft. 12½-inch casing, 50 lb.	3,000.00
1750 ft. 10-inch casing, 40 lb.	3,580.00
2600 ft. 8¼-inch casing, 32 lb.	4,180.00
3100 ft. 6⅝-inch casing, 24 lb.	3,525.00
3400 ft. 5 3/16-inch casing, 17 lb.	2,680.00
100-quart shot nitroglycerin	350.00
Add 10 per cent for unforeseen expenses	4,558.00
Total	$50,138.00
Estimated salvage of an oil well	7,890.00
Net cost of an oil well	$42,248.00
Additional salvage if dry hole	$7,775.00
Net cost of dry hole	34,473.00

TEXAS GULF COAST

December, 1921

A minimum estimate for a 3500 foot Gulf Coast well is as follows:—

Total depth 3500 ft. Rotary method.	
Derrick, 112 ft., complete	2,500.00
Drilling	
90 days at $75 per day	6,750.00
500 ft. 12½-inch casing, @ $3.50	1,750.00
3000 ft. 8¼-inch casing, @ $2.00	6,000.00
3500 ft. 6¼-inch casing, @ $1.65	5,775.00
300 ft. 4¾-inch lines, @ $1.25	374.00
100 ft. 4¾-inch strainer, @ $3.00	300.00
Packers, valves, etc.	150.00
	21,100.00
90 days' fuel	4,050.00
Water	250.00
Teaming	1,500.00
Rig repairs	1,000.00
Camp expense	1,350.00
Cost of completed well	$31,850.00

In this field, however, the nature of the formations, and the caving and other difficulties that may be encountered in the drilling cannot be so well foretold and provided for as in other fields. Furthermore, the difficulties are often sufficient to increase the cost of drilling enormously. One important well in 1920 cost $250,000. The above itemized cost is therefore a minimum estimate.

MEXIA, TEXAS
December, 1921

Total depth 3000 ft. Rotary method.	
Derrick, 112 ft., complete	$2,500.00
Drilling	
60 days @ $75 per day	$4,500.00
300 ft. 10-inch casing, @ $1.63	490.00
300 ft. 6⅝-inch casing, @ $1.22	3,660.00
Packers, valves, etc.	750.00
	9,100.00
Fuel, 60 days	6,000.00
Water	2,000.00
Teaming	1,000.00
Rig repairs	1,000.00
Camp expense	900.00
Cost of completed well	$22,500.00

HAYNESVILLE, LOUISIANA
December, 1921

Total depth 2700 ft. Rotary method.	
Derrick complete	$1,200.00
Drilling	
60 days at $75 per day	4,500.00
300 ft. 10-inch casing @ $1.53	460.00
2700 ft. 6-inch casing @ $1.07	2,890.00
Packers, valves, etc.	750.00
	8,600.00
Fuel	$2,700.00
Water $20 per day	1,200.00
Teaming	800.00
Rig repairs	1,000.00
Camp expense	250.00
Total cost of completed well	$15,750.00

KERN COUNTY, CALIFORNIA
December, 1921

Total depth 2000 ft. Standard method.	
Cost of rig complete	6,000.00
Casing and tubing	13,500.00
Labor, or drilling cost	9,000.00
Fuel and water	1,800.00
Tankage and pumping equipment	6,000.00

Drayage	1,500.00
Margin for accidents	2,000.00
Estimated total cost	$39,800.00

MEXICO

A well in the Panuco field costs between $40,000 and $50,000, and a well in the southern fields about twice that amount. A wildcat well in Mexico costs $125,000 to $150,000 on the average, according to its distance from good roads.

In exceptional cases wildcat wells have cost as much as $500,000.

CHAPTER XV

COST ACCOUNTING

The purpose of cost accounting is to analyze in detail the expenses of each step or process incurred in the making or procuring of a product. Whether the output is steel rails, felt hats, copper wire, automobiles, oil or gas, the responsibility of cost accounting remains the same. The information must be so elaborate and so detailed as to specify the cost of each factor involved in the making of a standard unit of the product, *i.e.*, the cost of the factors that make a *ton* of steel rails, a *gross* of felt hats or a *barrel* of oil. An illustration may make this clearer.

The total " Labor Costs " for a certain oil company, covering a month's production of 3182 barrels was $2865.10, or an average unit labor cost of 90 cents per barrel. The labor costs were divided under seven different heads, as shown in the following cost table:

MONTHLY LABOR COST ANALYSIS

June, 1919 — Production, 3182 Barrels

Occupation	Cost	Cost per Barrel
(1) Labor Pumping Wells	$834.31	.263
(2) " Repairing Wells	124.17	.039
(3) " Cleaning Wells	501.00	.157
(4) " Redrilling Wells	310.62	.097
(5) " Supervision	800.00	.251
(6) " Gen'l Property Work	95.00	.03
(7) " Storing and Shipping	200.00	.063
Total Labor Costs	$2,865.10	
Total Labor Costs per Barrel Produced		.90

Such a report presents in detail the occupational labor costs for producing a barrel of oil, the unit in this industry, for a given month. Reports of this nature, compiled not only for labor, but also for materials, and for overhead expenses, such as administration, depletion and depreciation, bring various marked advantages to the management and to the industry as a whole.

It is the purpose of this chapter to point out specifically the advantages that come with carefully determined costs and to set forth briefly a survey of the methods for compiling cost data.

Advantages of Cost Accounting. — The following five advantages are the more important contributions that cost accounting makes to the oil-producing industry.

(1) *Accurate Costs are Related to Efficient Operation.* — This fact is being realized more and more by the progressive oil producer. If efficient operation is defined as that which yields a maximum of output with a minimum of cost, it is evident that such operation can only be secured by having a constant analysis and study made of every significant item of expenditure. Such analysis makes possible comparisons with similar costs of previous periods, and also with costs of other projects carried on at the same time.

The manager who has installed a simple but effective cost system will soon look upon it as an investment from which he expects returns; he will view it as he views an improved piece of machinery. It produces returns because it points to weaknesses of operation that should be corrected, and to strong points that should be further developed.

(2) *Cost Accounting Eliminates Wastes.* — Slipshod methods of operation, careless handling of tools, needless destruction and loss of materials and supplies can be checked in part by having all of these elements regularly, accurately and definitely measured; but responsibility for such malpractices must be localized. The average individual does not really attempt to reach the goal that is set for him until he is made definitely responsible for high-grade, standard work.

Probably there is no greater compensation in maintaining a system of accounting than the locating and measuring of waste. For instance, a certain company carried an inventory of supplies and tools valued at about $78,000; yet it so ignored the negligence of its employees in the handling of the material assets, that it had to make an inventory adjustment figure as high as 35 per cent, at the end of the semi-annual period, in order to adjust the actual value of the material assets to the value as given in the books. It was a cost analysis that brought the trouble to light. First, no one person had been made fully responsible for the safe-keeping of the supplies, with the result that thievery and losses through carelessness were common. Again, in the doling out of supplies, careless counts and measure-

ments had been made. Where the requisition called for 150 feet of rope, the supply clerk, instead of measuring off this length, had made a generous guess and cut off 160 feet or perhaps 200 feet. Furthermore, the supplies and stores were so recklessly and carelessly handled that the loss caused by wind, rain, and breakage ran unnecessarily high. However, conditions became very different when one individual was held accountable monthly for all the supplies, and was compelled to keep accurate stock records of each item of materials.

In every concern, leaks are bound to occur; no company is immune to them. But if costs are kept, showing the expenditures in each operation, an increase in the cost of any item is quickly revealed by comparisons, and the executive is in a position to take up the matter for investigation.

(3) *Government Requirements Demand Cost Records.* — In considering depreciation and depletion in Chapter XVI, emphasis was placed upon the importance of these elements of costs from the standpoint of taxation. Unless properly determined costs are shown, not only for depletion and depreciation but for every form of cost, the management invites required revisions that make both trouble and needless expense. Taxes on profits are determined directly by costs, and unless costs are accurately determined, much trouble is experienced in ascertaining the true amount of taxes. Some of the expense of securing professional accountants could be reduced, and in some cases eliminated, if costs were kept in an intelligent manner by the company which is making up its tax returns.

(4) *Large-Scale Production Calls for Cost Methods.* — Most producing companies have grown to such size that the personal supervision formerly exercised by the chief executives has become practically impossible. The only reliable and scientific way whereby the modern management can measure and judge the many and varied operations of the organization is through a system of comparative quantitative reports.

The office of one fairly large company has its walls literally covered with charts and graphs covering its operations. Some of these data had their source in the operation of a comparatively simple but efficient cost-accounting system.

(5) *Sel ing Prices Are Related to Costs.* — The success of a company's operations is measured by the size of the margin between cost and selling price, *i.e.*, by profits. In the earlier stages of oil produc-

tion, margins were no doubt larger per dollar invested than they are today. A company was " made or broken " by the success or failure of a few wells. Today, with an ever-increasing proportion of old wells and with the installation of additional machinery for more complete extraction, a closer margin prevails, and greater attention to costs becomes appropriate.

The annals of the oil industry are filled with records of companies long since dead, which, during the first few years when production per well was high, made attractive reports to their stock-holders regarding their output and sales. But neglect to provide for the replacing of the dying investment through depletion costs led to their extinction.

The costs of producing oil go on whether they are measured or not. Unless they are measured, recorded and used, there is danger that the investor will be deceived by glowing accounts of sales and apparent profits, while in reality, sufficient provision for costs, which are indirect and hidden, has not been made. Such costs, however, are just as real and demand just as careful consideration as any other form of expenditure. Being hidden, they must be watched for more closely.

Principles and Methods of Compiling Costs. — The definite problem in providing a simple and effective cost system is to ascertain the amount of money which has been expended for materials, labor and expense in the development of a definite operation or undertaking.

During the last fifteen years much attention has been given, by the leading accountants and engineers in this country, to the development of methods which will give these results to the producer with the least amount of effort and expense. Only a brief outline of the general principles for compiling can be set forth in this chapter. The reader will find Bulletin 194 of the United States Bureau of Mines, entitled " Cost Accounting for Oil Producers," and the Report on the California and Wyoming Oil Industry by the Federal Trade Commission helpful.

Only the four most important divisions of a cost system for oil production are given here. These, however, form the basis from which most costs can readily be obtained. They are,

1. The voucher register;
2. Accounting for sales and material;
3. Accounting for expenses;
4. Cost statements.

These four divisions of a cost-accounting system must be looked upon as additions to the regular operation of the balance sheet and the profit and loss statements. (See Chapter XIII, on The Annual Report for a discussion of the balance sheet, and the profit and loss statement.)

(1) *The Voucher Register.* — The accounting principles involved in the operation of a voucher register are not difficult to understand. When every cent of money spent by the company is vouched for in writing by someone in authority, and is then listed on specially prepared forms, a classification is obtained for all expenditures made. A sheet which lists and classifies every voucher paid out by the company is called a voucher register. It is not desirable in large companies to require the signature of any one official to all vouchers. The work should be so divided that the approval is not merely a matter of form, but has a significance.

The form on the following page gives a simple voucher register used by smaller concerns.

Such a voucher register is capable of carrying an almost endless number of columns to meet individual needs. Each company organizes its forms according to the specific analysis it may desire.

In the larger concerns, the number of columns in the voucher register is reduced to three or four. These columns then act only as control figures, which refer to supplementary sheets giving the detailed information.

(2) *Accounting for Material and Labor.* — There are two kinds of costs that must be analyzed in every enterprise — costs of labor and costs of materials.

In the handling of payrolls, it is customary to put a voucher through the voucher register which changes the total payroll to a "Payroll Account." This account acts as a controlling account covering the payroll distribution sheets.[1] The amounts spent for labor can thus be analyzed with ease, and divided according to specific occupations, such as teaming, drilling, cleaning, repairing, etc.

The distribution of material costs is somewhat more difficult than that of labor costs. The difficulty occurs because materials are purchased at one period and often carried in stock (inventory), for an indefinite time before they are used. Hence a material and supply account should be kept, to record the stocks on hand. This

[1] See Chapter VIII of "Cost Accounting for Oil Producers," U. S. Bureau of Mines Bulletin 158, pages 54–58, for various forms of payrolls.

VOUCHER REGISTER — MONTH JULY 1921

Voucher		Explanation	Total Amount of Voucher	Distribution of Vouchers						
No.	Date			Administrative	Warehouse	Pumping	Repairs to Wells	Redrilling Wells	Storage and Shipment	Power Plant Items

"Warehouse" account is charged with materials when purchased, usually on the voucher register; it is a controlling account like payrolls, and is supported by the record sheets of the warehouse. When the warehouse gives out materials, the field clerk deducts from the stock record the units of material given out, prices them, and carries the information to his record sheet. At the end of the month his report will show the amount of supplies on hand and the amounts charged to the different operations.

Accounting forms for material recording[1] are also found in Chapter VIII of "Cost Accounting for Oil Producers," referred to above.

(3) *Accounting Expenses.* — Besides the material and labor costs, cost accounting must measure the indirect charges and administrative expenses, such as rent, salaries, stationery, telephones, postage, etc. Two other elements, depletion and depreciation, are treated as costs, as are also taxes and insurance.

Only of late years have depletion and depreciation received the consideration due them as cost elements. The authors have considered these elements of cost so important as to warrant their treatment in a special chapter devoted to that subject.

All indirect or administrative expenses may be handled through the voucher register by having appropriate column titles. Care must be taken to redistribute such charges for the specific periods of time for which costs are being calculated.

(4) *Cost Statements.* — Any oil company whose accounting system includes a voucher register and an analysis of payrolls and warehouse disbursements and gives proper regard to its administrative expenses and overhead costs, has the means of making monthly cost statements for the management. Considerable variety in statements of cost is possible, provided the proper accounting data have been recorded throughout the month. The important responsibility that rests upon the cost accountant is so to arrange his cost system as to be able to make out such statements as are useful to the management. The cost represents the summarized information which the executive uses as a basis for forming his judgments.

The two statement forms which follow are typical, and suggest the type and kind of information that the management may receive from its accounting system.

[1] See also Report of Committee on Uniform Accounting of the Natural Gas Association, Oliver Building, Pittsburgh, Pa.

FORM FOR PROFIT-AND-LOSS STATEMENT OF COMPANY OPERATING MORE THAN ONE PROPERTY (*a*)
OPERATING EXPENSES AND PRODUCTION FOR MONTH OF 192

Property	No. of wells	Labor	Supplies	Water	Fuel	Teaming	Miscellaneous	Total lease cost	Lease cost per well day	Remarks

(*a*) Convenient size, 7½ by 14 inches.

Form for Unit Costs and the Financial Status of Each Lease (*a*)

Lease .....

Month	Acres	No. of wells	Net production, bbls.	Well expense for month	Lease cost per well day	Purchase rental, etc.	Construction	Proportion of general expense	Total expenditure in month	Cost per net bbl.	Total outlay to date	Net production per month bbl. of oil	Revenue from production	Revenue to date	Revenue in excess of outlay to date

(*a*) This form may be divided into two forms — one comprising all matter up to and including the "Total" column and the two columns "Barrels produced" and "Cost per barrel," and the other including all matter to the right of the total column. If the form is divided, each part may be 8½ by 11 inches.

CHAPTER XVI

DEPRECIATION AND DEPLETION

There are three definite influences which cause changes in the value of the assets of oil and gas companies: fluctuation, depreciation and depletion. Fluctuation is due to market conditions and arises from causes entirely outside the control of the operating company. One might define fluctuation as a changing of valuation due to market influences.

Depreciation and depletion, in contrast, bear no direct relation to outside market conditions. Depreciation may be defined as the decline in the value of physical assets, such as tools, machinery, equipment, pipe lines, tanks etc.

Depletion may be defined as the decline in the value of the property caused by the extraction of oil from such property.

The important thing to remember about depreciation and depletion is that *they are costs of operating the business*, and they must be treated as such if the true condition of an enterprise is to be determined. The investor should beware of flowery statements concerning large profits, which make no allowance for the inevitable costs of depreciation and depletion. It should be seen that an accounting system which does not provide for these two factors of cost cannot give a true profit and loss statement. In its inflated profits are embodied losses of plant and oil value which have not been deducted as they should have been. The courts uphold the truth of the contention that depreciation and depletion are elements of cost. The decision in the Knoxville Case,[1] which has been looked upon as the leading case of this kind, states that:

"Before coming to the question of profit at all, the company is entitled to earn a sufficient sum annually to provide, not only for the current repairs, but for making good the depreciation and replacing the parts of the property when they come to the end of their life. *It is entitled to see that from earnings the value of the property invested is kept unimpaired* so that at the end of any given term of years the

[1] 212 U. S. I.

original investment remains as it was at the beginning." (Underscoring by the authors.)

Not only for getting a true picture of the financial condition of the oil company, but also for tax purposes, depreciation and depletion must be considered. It is only within the last year or two that oil companies have begun to take into account upon their books the two items of depreciation and depletion. Under the Federal Income Tax Law now in force, depreciation and depletion are deductible from gross income, in order to ascertain the net income which is taxable. This makes it imperative for oil and gas companies to provide for these items on their books, in order that they may determine the correct amount of their tax.

Inasmuch as depreciation covers the falling off in value of tools and equipment, and depletion the falling off in the value of the oil property due to extractions, each will be treated separately and in detail.

Depreciation. — Depreciation is the lessening in value of assets used in the business, and is the inevitable consequence of wear and tear and of the lapse of time. In the oil industry, depreciation is considered to include the decline in value of all fixed assets, with the exception of leaseholds and real estate. Such assets include buildings, well equipment, tanks, pipe lines and all other physical property which is used in the business and is not held for the purpose of resale.

This gradual diminution in value and usefulness of fixed assets should properly be recognized in the books of account, although many oil companies did not make adequate provision for it until income tax regulations compelled closer scrutiny. This loss in value is a cost of business, just as much as labor, pumping, teaming or any other cost. The purpose of recognizing it is to spread the cost of an asset over the accounting periods of its usefulness. If this were not done, the whole cost of the asset would appear as an expense of the last accounting period when it finally proves unserviceable. This is contrary to one of the fundamental principles of accounting.

Depreciation may be due to one or more of the following causes:

1. Wear and tear, consequent upon use.
2. Deterioration due to the passage of time and exposure to the elements.
3. Obsolescence, as parts of the plant become useless when supplanted by improved devices.

4. Inadequacy, as parts of the plant become inefficient because they are not large enough for the increased demand.
5. Accident, especially fire from lightning and prairie fires.

The causes of decrease in value, given above, resolve themselves into two classes. One class, in which fall the first two, consists of those items which can be controlled and planned for; the other comprises those items which are uncontrollable and which, for the most part, cannot be foreseen. Under this latter head fall the last three causes of depreciation.

The proper method of booking depreciation is to charge the amount to an expense account, which may be called simply "Depreciation," and either to credit the asset account with the same figure, or, still better, to credit a valuation account termed "Reserve for Depreciation." This keeps the value of the asset on the books at its original cost or value, and on the balance sheet the valuation account is subtracted from the book value in an inside column and the net amount is extended into the asset column, in order to show the estimated present value of the asset in question.

When the rate of depreciation has been determined, a charge is made to the Depreciation account and a credit of the same amount to the Reserve for Depreciation at the end of every accounting period. When the asset is finally disposed of, the asset account is credited and the surplus account is debited. The amount received for the asset as scrap or salvage is also credited to the asset account, either directly or through the valuation account, and any small balance which remains standing on the books as an asset should be disposed of as a charge to Depreciation for the current period.

The amount of depreciation to be charged off must depend upon:

1. The original value of the asset.
2. The residual or scrap value of the asset.
3. The ordinary life of the asset.

Of the above factors used to determine the rate of depreciation, the original value, or purchase cost, of the asset is known, and the residual or scrap value may be foretold with a fair degree of accuracy. The length of life of the asset, however, is the most difficult to determine, as it is dependent upon so many different factors, such as the nature of the asset, its use and surroundings, the climate, etc., but the life must be estimated as nearly as possible. To aid in such estimates, records of life of the various assets in the company's own practice

should be definitely recorded as the data accumulate. In the case of well equipment, it is considered good practice to depreciate it according to the estimated life of the average well, making allowance, of course, for salvage.

It is not the authors' purpose to go into detail here in regard to the different rates of depreciation on the different types of property used in the oil business, but, inasmuch as the rates of depreciation vary for the different classes of property, and as the Income Tax Law requires that the different types of property be depreciated according to different rates, it is suggested that the physical property be classified as follows for depreciation purposes:

1. Drilling equipment
2. Well equipment
3. Dehydrators
4. Tanks
5. Tools
6. Transportation equipment
7. Water plants
8. Electric equipment
9. Machine shop
10. Buildings
11. Pipe lines
12. Refineries
13. Sales or marketing equipment.

Suggested lengths of life of these items and others have been proposed in the Manual of the Oil and Gas Industry published by the Treasury Department for the information of taxpayers.

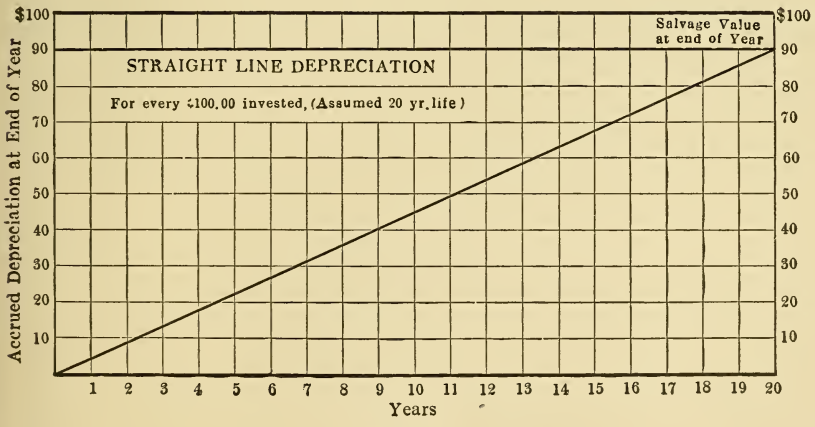


FIG. 20.

After the accountant, from his knowledge of the original value or cost and the probable scrap or salvage value, has estimated the probable life of the depreciable property in question, it is his duty to book

the depreciation from year to year according to one of the widely accepted depreciation methods. The best-known method of depreciation is that called the straight-line method. It s so called because it employs a straight descending line as a graphical representation of the depreciated value of the asset from year to year. By the straight-line method (Fig. 20), the total amount to be charged off is distributed equally to each of the accounting periods. This is the method the authors would recommend for use in the oil business, more because of its simplicity and wide use than for any theoretical advantage over other methods, which are more complicated when applied to the oil business.

Depletion. — Depletion, as has been noted, is the decline in value of the investment in an oil property caused by the exhaustion of the recoverable oil. Only of recent years has it been realized that this decline in value should be taken into consideration on the books as an expense, just as an allowance is made for depreciation. If depletion were not so considered and booked, the net profit for each period would include some of the capital which had been invested in the oil properties. Therefore, in order to keep the original investment intact and to provide for the development of new properties, as exhaustion of the properties now operated inevitably ensues, a Reserve for Depletion should be set up on the books.

The method for booking depletion is the same as that for depreciation. The estimated amount of depletion sustained during the year is charged to an expense account called the Depletion account, and the same amount is credited to a surplus account called Reserve for Depletion. On the balance sheet this valuation account should be deducted from Operated Leases account in an inside column, in order to show the net present value of the operated leases.

The amount of depletion to be charged off during the year depends upon the production during the year as compared with the total amount of recoverable oil under the property at the beginning of the year. The production is a known quantity, and the problem of estimating depletion resolves itself into the determination of the recoverable underground supply. Accurate calculations of underground oil are impossible, but where proper records of a developed property or district have been kept, reasonably reliable estimates may be made. These estimates are less reliable in proportion to the lack of development or the lack of proper records.

The Income Tax Law of 1918 specifically provides that accounts

for depletion shall be carried on the books of every oil company claiming a depletion allowance as a deduction from gross income, in order to ascertain the amount of net income which is taxable. As most oil companies had failed, up to this time, to take depletion into account on their books, any depletion accounts must be made consistent with this law as long as it remains in force.

The law provides that the deduction allowable for depletion shall be based on the following:

(*a*) Upon cost, if acquired after February 28, 1913; or
(*b*) Upon the fair market value as of March 1, 1913, if acquired prior thereto; or
(*c*) Upon the fair market value within thirty days of discovery, in the case of oil wells "discovered" by taxpayer after February 28, 1913, where the fair market value is disproportionate to cost.

The amounts from (*b*) and (*c*) are called the capital sum and must be set up separately, in the case of oil, for each tract or lease. This capital sum, depleted down to the beginning of the year, is divided by the future estimated production for the tract or lease, and gives what is called the unit cost. This unit cost, multiplied by the number of barrels of oil produced during the year, gives the amount of depletion sustained during the year. The total of all these figures, for all of the leases for which a capital sum has been set up, gives the total depletion sustained, which is deductible from gross income.

According to the law, oil depletion must be calculated upon the individual tract or lease. It is therefore necessary, in order to arrive at a reasonable depletion figure, that accurate records be kept for each lease. In the calculation of depletion, many difficulties are met on account of incomplete and unsatisfactory records. Some record forms that will enable any oil company to have its depletion calculated more accurately and more quickly are given as Fig. 21.

First, a separate record of the cost of each individual lease should be kept, as this is the amount to be set up as capital sum for that lease, providing the same was acquired after February 28, 1913. This cost should include the original bonus or cash paid for the lease, as this represents the cost of the oil under the property, any expenses incurred in acquiring the property, and any costs of development, provided that all of these have been charged to investment accounts and not to expense accounts.

OPERATED LEASES LEDGER

Lease No. 2956 Farm Name *John Jones*

Township *Springhill* County *Greene* State *Pa.* Section..... Range.....

Date	Explanation	Capital sum	Annual Depletion Burden									
			1913	1914	1915	1916	1917	1918	1919	1920	1921	1922
	Fair market value 3–1–13	$69,000.00	$7,000.00	$6,000.00	$4,000.00	$3,800.00	$3,500.00	$3,200.00	$3,000.00	$2,700.00		
	Balance brought	forward	69,000.00	62,000.00	56,000.00	52,000.00	48,200.00	44,700.00	41,500.00	38,500.00	25,800.00	
	Capital sum during	added year	None	None	None	None	None	None	None	None		
	Total Capital	Sum	69,000.00	62,000.00	56,000.00	52,000.00	48,200.00	44,700.00	41,500.00	38,500.00		
	Deduct	Depletion	7,000.00	6,000.00	4,000.00	3,800.00	3,500.00	3,200.00	3,000.00	2,700.00		
	Balance	forwarded	62,000.00	56,000.00	52,000.00	48,200.00	44,700.00	41,500.00	38,500.00	25,800.00		

FIG. 21. — Operated Leases Ledger, Page

Article 216 of Regulation 45, relating to the Income Tax Law of 1918, provides that every taxpayer claiming and making a deduction for depletion in the case of an oil property shall keep accurate ledger accounts in which shall be charged the fair market value as of March 1, 1913, or within thirty days after the date of discovery, or the cost, as the case may be, of the oil and gas contents of the property, together with such amounts expended for development as have not been charged to expense. These accounts shall be credited with the amount of depletion claimed and allowed, so that when the sum of the credits for depletion equals the value or cost of the property plus the amount added thereto for development, no further deduction for depletion with respect to that property will be allowed, except as additional cost, other than expense, is incurred.

Whether the cost referred to in the above article should include, in addition to the bonus or cash paid for the lease and any expenses incurred in acquiring the lease, the cost of drilling and other development costs, depends on whether it is the practice of the company to charge these to Operated Leases account or to some other capital account, or to expense account. According to the law, the taxpayer may charge these items either to expense or to investment, but whichever system is adopted must be followed consistently thereafter.

To comply strictly with the provisions of this article, the use of a subsidiary ledger is desirable. This ledger may be called the Operated Leases Ledger or some other suitable name; the Operated Leases account in the general ledger will be the controlling account and will represent the value of all the operated leases. This Operated Leases ledger should contain an account for each operated lease charged with the capital sum set up for that lease; it is ruled as in Fig. 21 so as to show the depleted value from year to year, while the controlling account in the general ledger will be offset by the valuation account, Reserve for Depletion. In this case, the Operated Lease ledger is represented by two accounts in the general ledger, and the total of the balances of the Operated Leases account less the balance of the Reserve for Depletion account. Thus, neither the Operated Leases account or its valuation account is a true control over the Operated Leases ledger.

A monthly record of the cost of operating each lease, including its share of the general expense, should be kept. Such first-hand, recent, local data are very valuable in the appraisal of the wells.

If it is at all feasible, accurate monthly production records should

be kept for each individual well, as such records are useful in determining the average rate of decline of the wells in any district, upon which the estimation of the future production of the wells in that district may be based. A record of individual well production is useful in proving discovery, as the fair market value, which is allowed to be set up as " capital sum " for the lease on account of the discovery, is dependent upon the first thirty days' production of a discovery well. For the appraisal of such a well, it is desirable to know the relation of this thirty days' production to that of the first year.

When the lead lines from all of the wells on one property flow into one or two tanks, and new wells are coming in from time to time, it is not only impossible to measure the production of any one well, but it is difficult to estimate the average production of old wells as distinguished from the new. It is obvious that such facts constitute the vital statistics of a producing lease, and deductions made from them must govern the estimation of the future production of the property, the drilling of new wells, their spacing and location, and the rate and time of pumping individual wells.

When there are but two or three wells on a lease, even though all flow into one tank, their individual daily or weekly production may be determined by pumping them intermittently and keeping a careful record of the tank gauges. This plan may also be followed in the measurement of flowing wells. A common method of estimating the production of individual wells is to compare the time required to " pump off " various wells, or the length of time of the flow at the tank end of the lead line. Where the wells all discharge into one tank, each by a separate lead line, this method may be resorted to if no better method is feasible. The motion of the pumping jack will give a rough indication of the time required to pump off, if the lead lines are not separate.

More accurate results may be obtained by the use of a separate intermediate measuring tank. It is believed that the individual well production records obtained in this way will more than justify the cost of this extra tank on most leases having more than one well.

A monthly record of the percentage decline of each individual well, or at least of the group delivering to one tank, should be kept, preferably as a graph. Such an accurate record of the decline of the wells on an oil property is considered absolutely essential by the careful operator or appraiser, in order that he may estimate the future

recoverable oil, both as a basis for the valuation of the given property, and as an aid in valuing similar properties.

There is one uncommon type of company or partnership which may well treat its depletion and depreciation by a different method. This is one organized for the express purpose of exploiting one property with the intention of liquidating at its abandonment. Here no reserve for depletion should be made, but the corresponding allowance should be calculated in order to obtain a deduction in the income tax, and it should then be issued as a special liquidating dividend.

Summary. — The oil company should make a depreciation allowance and a depletion allowance in its books. On this reserve its future life, and so its continuity, depends. Without such a reserve a company may seem to be in good condition although the investment may never be amortized. The only exception is in the case of a company or partnership formed merely for the purpose of developing one property.

CHAPTER XVII

TAXATION

State Taxes. — The state taxation of oil-producing companies in various states is mainly on the basis of a percentage (usually 2 to 3 per cent) of the value either of the year's production or else of the physical plant. It ignores the reserve of oil underground. Neither basis is just, from the standpoint of the economist, but each has the merit of ease, economy and relative certainty in fixing the tax.

Federal Taxes. — The Federal tax, on the other hand, is an income tax, and while probably the most just, it is also a most difficult tax to fix. In addition to income tax, a war profits and an excess profits tax were assessed by the Act of 1918, but were omitted in the Act of 1921.

To ascertain net income, deductions must be made from the gross receipts for the year. In this respect the producers of natural resources received special consideration because of the exhaustible nature of their assets. The return on the investment at the rate of recovery of the resource is provided for by a deduction for depletion. Primarily, deductions are based on the investment. Difficulty was encountered in attempting to fix all depletion deductions on investment, because many companies obtained their holdings many years ago and for a nominal amount, prior to the inauguration of the income tax. Consequently, a deduction based on valuation of the resources, as of that date (March 1, 1913), was considered fair and reasonable. For the benefit of the operator who hazards large sums of money in opening up new pools, a clause permitting valuation within thirty days of discovery of a new pool or producing horizon was inserted in the Act of 1918. This was later interpreted to comply with decisions based on the mining laws and is now limited to 160-acre areas, this being the area allowed to a corporation, under the mining law, as claim for discovery.

Depletion depends largely upon the valuation figures which must be prepared by the taxpayer and fully substantiated by him. The profit from sale of assets may likewise depend on a valuation. This,

unfortunately, is a difficult, technical matter, which calls for a careful preparation of reports and for a thorough understanding of appraisal methods and also of income tax procedure.

Preparation of Tax Returns. — To prepare the tax return of an oil company, one should provide himself with the following literature:

1. A copy of the Act, which is Public Document No. 98, Sixty-seventh Congress. It may be had on application to a Congressman.
2. Bureau of Mines Bulletins, No. 177 (30 cents), and No. 194 (10 cents), to be obtained from the Superintendent of Documents, Washington, D. C.
3. Regulations 33, 45 and 62 (edition with addenda) of the Treasury Department.
4. Questionnaire for oil producers, of the Treasury Department. (The one current in January 1922 is called Form O.)
5. The Manual of the Oil and Gas Industry, revised August 1921, published by the Treasury Department (25 cents), but obtained from the Superintendent of Documents, Washington, D. C. An early printing of this edition has a commissioner's ruling, on page 45, which has since been deleted.
6. Subscription to the Internal Revenue Bulletin, which is issued weekly. This is obtained from the Superintendent of Documents, Washington, D. C. ($2.00 a year).

A copy of the oil and gas questionnaire is first obtained from the local Federal Tax Collector. The first schedules to be filled out are I, IV, VI, and VII. The remaining schedules are dependent upon these. Schedule I calls for the cost of the property at the time of acquisition. The blanks must be filled out separately for each producing lease. They offer little difficulty except when some of the data are not obtainable. When the bonus was merely nominal and other expenses were charged as such, and when one knows that the cost, though it could be ascertained, would not be large enough to warrant the search, one is justified in writing across a number of these entries " cost only nominal and not claimed." Nearly every oil company has a number of abandoned leases, the whole cost of which is so low and always so difficult to ascertain that it is advisable merely to state that there have been such leases and that the costs were not large enough to warrant preparation of the data to claim the amount in the " capital sum."

Valuation Schedule. — Schedules IV, VI, and VII offer little difficulty, although they are time-consuming and lead up to the very difficult Schedule II. This is the valuation schedule and is made out for properties as of March 1, 1913, the date on which the Income Tax Law went into effect. The most obvious way to ascertain " fair exchange value " is to cite sales of similar properties. If there was a sale of a truly similar property by a willing seller to a willing buyer, on the same date, it is an exact index of " fair exchange value." But such sales are so extremely rare that it becomes a question of how dissimilar the properties may be and still permit the analogy to be drawn. The sale must have taken place at very nearly the same time, because the expectation of future price, and hence the tone of the market, changes from day to day.

Analytic Appraisal. — When no sale sufficiently analogous can be found, one must resort to an analytic appraisal. The method recommended is to establish first a predicted price curve for what may reasonably have been expected, at the time of appraisal, to be the probable future prices at the well, as described in Chapter XXI. One must also calculate an advance in costs. From these, one may get an average expected profit per unit for each successive year in the future, until the abandonment of the well.

The next task is to estimate the yield of the well in succeeding years. This estimate must be based on the analogy of those wells of known history that are most comparable. Only when analogous wells are not known, should the appraiser estimate the reserves by calculating the voids in the reservoir. This method is too faulty to use except in very rare cases.

There are two methods for combining the records of many wells to make generalized curves which can be used to advantage. One, that of Lewis and Beal (Fig. 22), described in the Manual of the Oil and Gas Industry, ignores age or pressure, but can be employed when the data are too imperfect for the other method. The second method is the one presented by the senior author at the 1921 meeting of the American Association of Petroleum Geologists. By this method, the first year's production of all the wells is plotted against that of the second year, and a line is drawn through the points (Fig. 23). The second year's production is then plotted against that of the third year, and so on. For a well of any size and any age, one can now read the probable production for the following year and so construct a decline curve (Fig. 24).

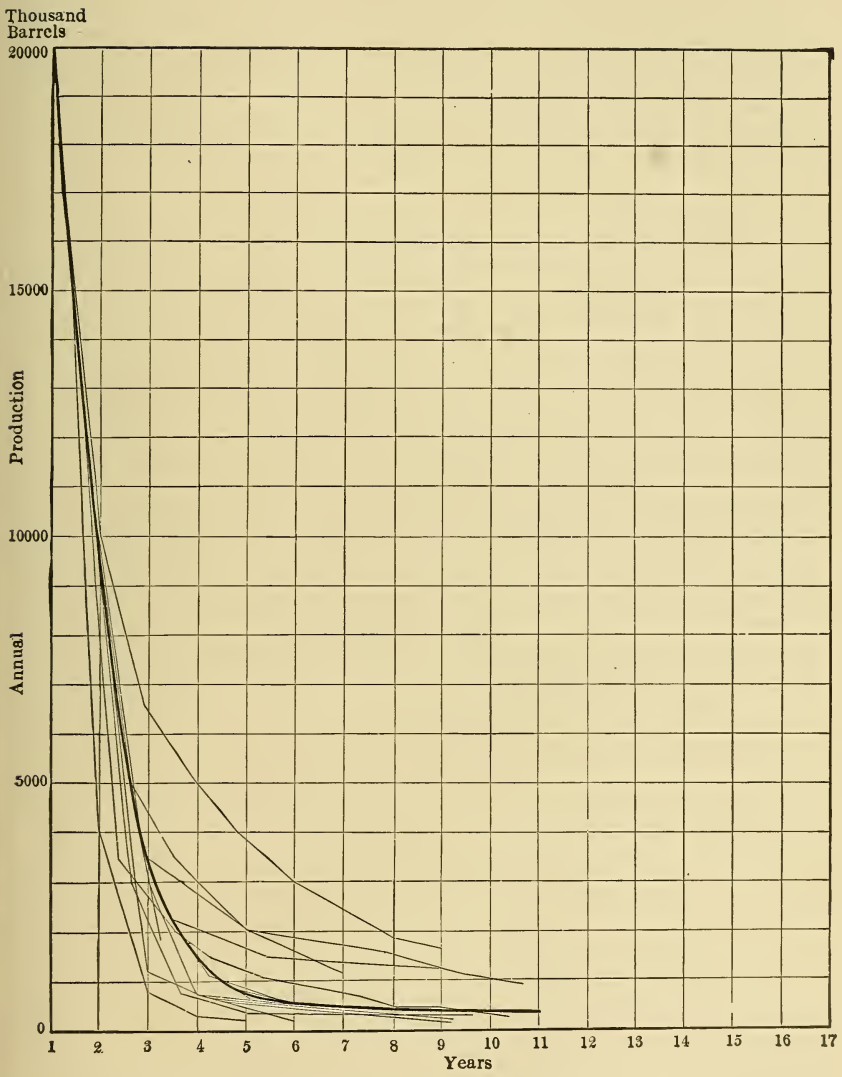


FIG. 22. — A composite decline curve made by Lewis and Beal's "family curve" or shingling method.

If the curve constructed by either method does not extend to the economic limit of production, it should be extrapolated to the limit established. The methods employed for such an extrapolation are described in the Manual of the Oil and Gas Industry, previously cited.

After the expected profits have been determined for each year by this method, the profits of each individual year are multiplied in turn by a compound discount factor for the year. None of the pub-

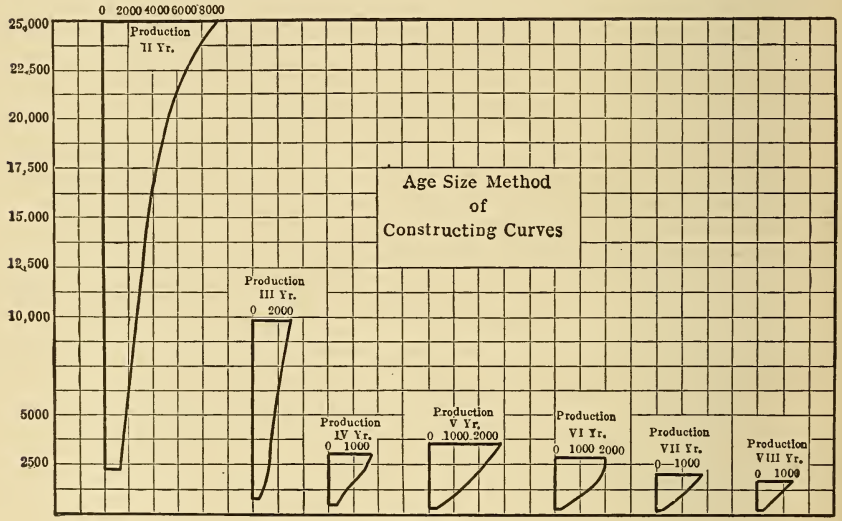


FIG. 23.

lished " present worth " or compound discount tables are adapted for this purpose, as they all start with a full year and assume that the money is not realized till the end of the year. It should be observed that, if the appraisal is of March 1, 1913, as so many are, the compound discount factors should be calculated on the basis that the average dollar is received at the middle of the period covered, *i.e.*, at the end of five months in the first ten months' period in 1913, and at the end of each six months in the subsequent calendar year periods, if the production data are assembled by calendar years. If the data are available by months, year units of March 1 to March 1 may be employed. The rate of compound discount that should be used is controlled by the degree of reluctance on the part of the investor to invest under the particular circumstances. To the sum of the discounted, future, expected profits add the discounted value of the eventual salvage, to get the full productive value of the well.

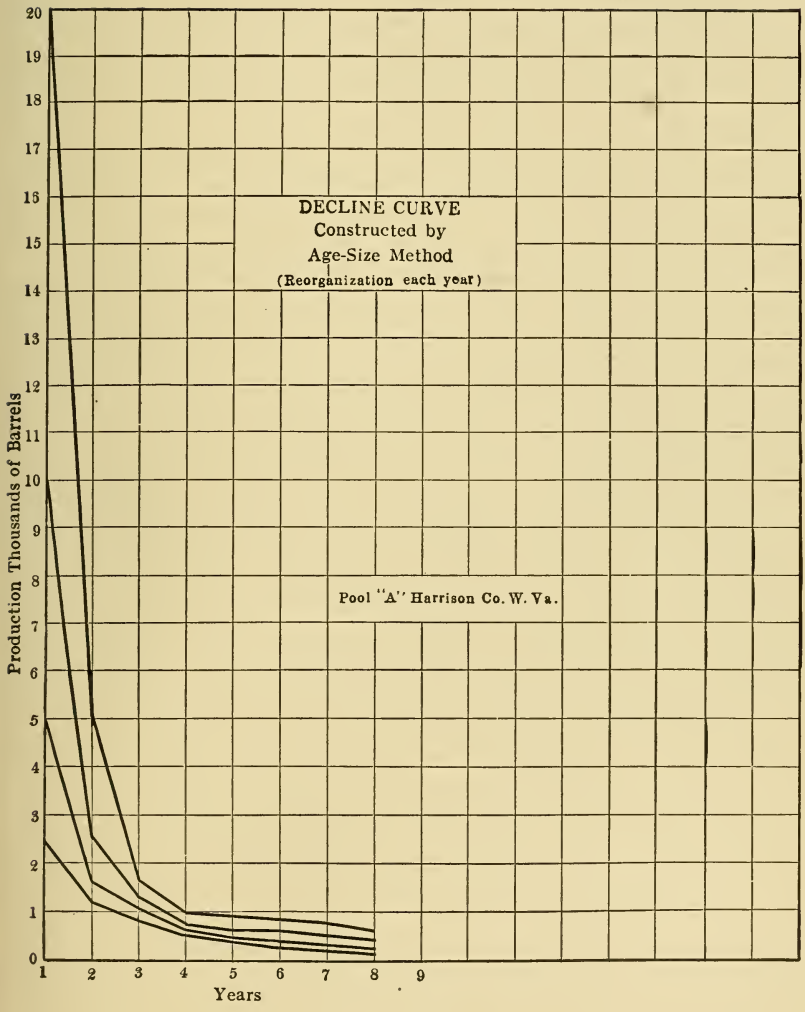

DECLINE CURVE
Constructed by
Age-Size Method
(Reorganization each year)
Pool "A" Harrison Co. W. Va.
Production Thousands of Barrels
Years
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

FIG. 24.

The buyers of oil properties are ordinarily unwilling, of course, to pay an amount equal to the full productive value expected. A further discount for the risk of the investment is therefore necessary in the appraisal of most properties. Moreover, in the valuation of undrilled acreage, the discount for risk is higher, and a further discount is necessary for deferment on account of loss of pressure from the opening of other wells.

The questionnaire calls for the separate cost determination or valuation of every producing lease. Where a lease has more than one discovery claim, each must be valued separately. After the well or wells and their supporting acreage have been appraised, the remaining acreage in the discovery area or lease should be given a percentage of probability of its being found productive when drilled. The value of the productive acreage, as acreage, is multiplied by this probability, and, less deduction for reduction of pressure because of deferment of drilling and a further deduction for risk, gives us a value for this remaining portion of the discovery area or lease.

Non-producing leases may be reported under one head, that of undeveloped acreage; a more detailed classification would be of no consequence to the Department, as such leases cannot be entered in "capital sum" until they become productive. The next step is to calculate the value of the physical property as of the date of appraisal. If it was installed prior to 1913, the original cost must be depreciated to a 1913 basis. The rate of depreciation of the well equipment is generally calculated on a straight line for the estimated life of the well, but may be made proportionate to depletion.

The value of the physical property, as of the date of appraisal, must now be deducted from the fair exchange value of the whole property. This value of physical property constitutes the depreciable capital sum after an amount or a percentage equivalent to the eventual salvage has been subtracted. The fair exchange value, less the cost of the physical property, is the depletable capital sum and represents value attributed solely to the oil in the ground. It in turn, however, should be divided into three parts, one representing the cost of the oil reserve, the second that of drilling and exploration (earnings on both of which are merely a return of capital) and third, the remaining portion of the value. The last is an appreciation shown by the appraisal above cost. Such earnings can be transferred to surplus and increase the invested capital, provided they are not distributed as dividends.

Rate of Depletion. — We now have the amount which is to be taken as depletion and depreciation allowance through the years, in proportion as depreciation and depletion are sustained. It remains to ascertain the rate at which the depletion allowances are to be taken for use in Schedule V, on Depletion. To do this, one must first get the estimated future recoverable reserve of oil as of the date of completion. This is a technical procedure similar to that described in estimating future production for appraisal purposes. Aid can be had from the Manual cited and from Bulletins 177 and 194 of the Bureau of Mines.

The salvage value received in the terminal year may be taken as a further deduction from income of that year, since it is a return of capital. If the books of the company have not considered salvage value, some other procedure, in line with the accounting methods of the company, is sometimes used.

The rate of depletion is based on the rate of decline in production. That is, if the reserve is 1,000,000 barrels on one lease, and the depletable capital sum is $500,000, then a depletion allowance of 50 cents is deductible for each barrel produced. These depletion allowances must also be calculated separately for each lease.

The construction of the curves for ascertaining the amount of oil to be depleted is essentially like that of curves for appraisal, except that in appraisal the curves, and therefore the valuation, must be set up once for all, and no information received subsequent to the date of appraisal can be utilized. On the other hand, in making out the depletion rate, all the data are utilizable, and revision from year to year is not only permissible but is required by the Treasury Department, unless the values involved are of negligible magnitude.

The economic limit, *i.e.*, how small a well may be before it must be abandoned, is a matter to be determined for each field. In doing so, one should assume that the limit will become progressively lower in the future.

Rate of Depreciation. — The depreciable capital sum, in so far as it is represented by well equipment, should be depreciated on either the straight-line method, based on the life of the well, as in Fig. 20, or on the basis of unit cost, as in depletion. Features such as pipe lines, marketing facilities, etc., receive straight-line depreciation, based upon what experience and judgment show to be the probable term of life. This will be that of the field rather than of the average well. To the capital sum there should be added, each year, the money

invested in new physical property and also the money spent in the new development work, one going into the depreciable capital sum and the other into the depletable capital sum. Cost should always be entered as the capital sum, unless the well is such as to permit the use of ascertained value according to the Regulations.

Deduction in Cases of Discovery. — Certain conditions give the right to use a discovery appraisal right, instead of cost. First, the well must have a value which is disproportionate to cost, roughly twice its cost or more. Further, the acres of the reservoir appraised must have been purchased or leased prior to its having become a proven area, and it must not have previously received a discovery appraisal.

The deduction for depletion is allowed only to the party in possession at the time of discovery and not to the subsequent purchasers (Treasury Decision 3089). This means, of course, that the depletion, which the purchaser is entitled to, is based on the value at time of sale, not on the value at time of discovery. The lessee, as well as the lessor, profits by the discovery right.

The definition of what constitutes a proven area is given by the Regulations as the 160 acres of that reservoir surrounding the well in question. From this it follows that a well which strikes oil in a different reservoir, although in the same area as that in which the 160 acres is proven, may constitute a discovery. The area to be appraised, in case of discovery, is all within "the exterior limit of a continuous tract held under leases or in fee by the taxpayer" and included within a 160-acre square surrounding the discovery well. In case the lease has had a former appraisal, as of 1913, only the value newly created is to be used.

Appraisal of Discovery Wells. — In appraising a discovery well, one is, of course, limited to the knowledge of that date. This involves the use of a different predicted price curve, one predicted as of that date rather than that which would have been used March 1, 1913. The Regulations permit the appraisal to be of the date of discovery or thirty days thereafter. Unless the value increased during these thirty days, one should appraise, of course, as of the earlier date, because depletion is most rapid in the first thirty days and is not allowed until a valuation is established on the property. Observe that the unit to be appraised is not only the well and its supporting acreage, but the deposit underlying the acreage of the reservoir extending beyond this, which may in some cases be as much as 160 acres. The

Treasury Department will not allow all of this to be appraised as if it were truly proven or 100 per cent probable, although it is legally so called; it must be appraised on the basis of its " fair exchange value." To ascertain its fair exchange value one can, of course, fall back on analogous sales as before, or else one may assume a percentage value of the inner acreage, which supported the first well, as expressing the probability of its being productive. If 10 acres are allowed to the discovery well, there are then 150 additional acres or less for appraisal as acreage. The value of this outlying acreage is ascertained as a percentage of the value of the developed acreage in the center, after the drilling and development cost expended, per acre, upon the developed acreage has been deducted. The value so obtained should involve a further deduction because of the risk of investment and the loss of pressure from deferred drilling.

Even though an area is proven for oil, the discovery of the first commercial gas well in this area, if commercial as to its gas alone, will permit a discovery appraisal right for gas, if other conditions are fulfilled.

Gasoline Appraisal. — Where gas has a gasoline content in commercial quantity, obtained either by the compression or the absorption method, a separate value should be placed on this product. In case the gasoline prospects would have been allowed a value by a buyer or seller in arriving at a price of the whole property at the time of appraisal, this value is to be included in both the 1913 and the discovery appraisal. However, where the well is a commercial gas well, the gasoline is treated as a part of the gas, not as a third product. Where an oil well produces casinghead gas in an amount not sufficient to justify drilling for the gas alone, it is considered an oil well with a gas by-product, not a " gas well."

Gain from Sale. — " In computing the gain from sale of wells discovered after March 1, 1913, the taxpayer is not entitled to set up the value as of date of the discovery as the basis of the computation." (Solicitor's Opinion No. 26.) However, where the " principal value of the property has been demonstrated by prospecting or exploration and discovery work done by the taxpayer," the tax is limited to 20 per cent. This opinion results in so heavy a tax in such cases, that the seller may well consider whether it is not better for him to hold rather than to sell, so as to get his depletion allowances on the higher discovery value where that value is permitted.

Income Tax Law for Previous Years. — While the Income Tax Law applying to 1918 is worked out on the same basis as that of later years, with differing rates, the Income Tax Law applying to 1916 and 1917 has one important difference, namely, that the depletion allowance to the lessee is allowed only on cost, not on appraisal value, and that there is no discovery appraisal right. In the case of the lessor, however, depletion allowances may be based as in the law of 1918 with reference to appraisal of March 1, 1913, but not discoveries. Note, however, that discoveries made in 1917 and as far back as March 1, 1913 are permitted for purposes of calculating the tax for 1918 and thereafter.

The laws applying to 1913, 1914 and 1915 grant an allowance for depletion only to the extent of 5 per cent of the gross value of the product. The law does not permit us to go back and redress this deficiency, although this allowance is now admitted to be inadequate. It is necessary to take off a sustained depletion in calculating the tax for later years, even though it was not allowed at the time. Moreover, this 5 per cent limit does not apply to the depletion of invested capital.

Conclusion. — Oil companies must realize the great amount of labor required merely to hunt up the data necessary to fill in the oil questionnaire and its supporting blanks for each producing lease, entirely aside from the technical matters of establishing proper valuation, recognizing which wells have the discovery right, evaluating these discoveries properly, and working out the rate of depletion. The task commands vastly more attention than has heretofore been given to taxation. Preparations for it should be made throughout the year, and, when necessary, methods of management and accounting should be so changed as to make possible the preparation of an acceptable report. The Treasury Department finds it necessary to reject many of the reports now submitted. The responsibility for preparing the report should be assigned to the appraiser, an officer best assigned to the geological division of the land department.

CHAPTER XVIII

DRILLING METHODS[1]

While the subject of drilling methods belongs more properly to technology than to business, the executive must have some knowledge of the principal methods, their applicability to different conditions, and their relative expense and limitations.

Systems of Drilling. — While from time to time in the history of the petroleum industry, various methods of drilling have been developed to suit particular needs, these are all modifications of the two general systems in use today in North America, viz., the standard or cable-tool system, and the rotary system. Their various modifications, such as the Canadian pole-tool system and others, are of interest principally from an historical standpoint. The two systems mentioned have been developed to suit different needs as new fields were opened, and are seldom used side by side in the same field, except in some districts in California and Mexico.

The rotary method was first employed for oil-well drilling by Captain A. F. Lucas, who used it in Texas to drill in the soft Quaternary and Tertiary formations of the Gulf Coast. These soft formations caused so much trouble to drillers using the " standard " tools of the Appalachian field, that it was impracticable to proceed. It is true that a few districts in this region have been developed by men from the Appalachian fields with the cable tools with which they were more familiar, although in the light of subsequent events it is evident that the rotary system would have been better.

[1] For complete description of the actual operations used in drilling and in casing oil and gas wells, the reader is referred to the following:
Westcott, H. P., Handbook of Natural Gas.
Paine and Stroud, Oil Production Methods.
Bowman, Isaiah, Well-Drilling Methods (U. S. Geological Water Supply Paper 257).
Thompson, A. B., Oil Field Development.
Suman, J. R., Petroleum Production Methods.
McLaughlin, R. P., Oil Land Development and Valuation.
Jeffery, W. H., Deep Well Drilling.
David T. Day and others, Handbook of Petroleum.
Catalogues of the various supply companies.

Operators are loath to change from accustomed methods unless conditions seem compelling; and when one system is well established in a field, the initial expense of drilling a well by a rival system is so much more than by the familiar method, that inertia inevitably impedes experimentation. This is partly due to the fact that the other type of tools is not carried by the local supply houses, and that spare parts are difficult to obtain without delay, while the supply of local labor does not answer for a class of work with which it is not familiar.

However, in California and Mexico, a class of men accustomed to both systems has been evolved, through the use of the so-called "combination" rigs. A "standard" driller who is afterwards trained to the use of the rotary machine is normally more efficient than a man who has received his first training with the rotary. The reason for this is that the cable-tool drill accustoms the driller to watching the variations in the formations through which he is passing, since he usually drills with a dry hole and runs the bailer frequently. He is thus accustomed to keeping a better log of the well as he goes down. On the contrary, the wash from the rotary machine furnishes an obscure record as to the formations passed through, and it is difficult to keep an accurate log. Furthermore, the weight of the column of water used in the rotary system suppresses all minor evidences of oil, gas and water.

In the matter of casing, when the rotary method is used, there is less occasion for the use of the driller's judgment, since casing is generally dispensed with until the hole has been made. Men trained in the use of rotary apparatus may become good mechanicians, but as a rule are not able to cope with emergencies to the same extent as are those who use the cable tools.

"Standard" or Cable Drilling System. — This system is also called the percussion, churn, or American cable system, and consists essentially of a heavy steel bit attached to a manila or wire cable, which is raised and dropped in the hole by means of a walking beam extending over the hole.

It is a system adapted for drilling into formations which are sufficiently consolidated to permit the sides of the hole to "stand up," so that drilling may be carried on with an uncased hole until it is advisable to case off some water- or gas-bearing stratum. The Paleozoic rocks found in the Appalachian, Lima-Indiana, Illinois and Mid-Continent fields, and some of the harder Tertiary rocks of California, are therefore drilled by this standard system.

In some soft formations cable-tool drilling is made possible only by the use of an under-reamer to enlarge the hole, so that the casing can be lowered. By this means no great length of open hole is left uncased and so caving is minimized.

This work is slower and more expensive than ordinary cable-tool drilling, as it is necessary, for each casing length, to change from drilling to under-reaming and then to put casing in. The mere change of operation in itself causes a serious loss of time.

There are some districts where part of the hole stands up very well, while other formations in the same hole cave badly. It is then necessary to decide which system is the better to use under the circumstances. The added time and expense necessary to under-ream, plus the added chance of delay through accidents if the cable tools are lost, must be balanced against the greater cost of the rotary outfit, the difficulty of handling the harder part of the hole with a rotary outfit, the probable inaccessibility of spare parts of the less common system in the local supply stores, the question of the availability of the larger supply of water necessary for the rotary, the necessity for a larger crew, and the greater cost of hiring men experienced in rotary drilling. In the district to which it is best adapted, the rotary consumes less time in drilling. For instance, to drill a 2000-foot hole with standard tools in Pennsylvania or West Virginia takes about thirty days; while to drill a 2000-foot rotary hole in Louisiana takes from fifteen to twenty days.

This saving in time offsets, to some extent, the greater labor cost per day of the rotary, which requires a crew of five or six men per tour as against a standard-rig crew of two men per tour.

The heavy column of water which must be used in a rotary hole puts so much pressure upon the formations that comparatively weak or small shows of oil or gas are not indicated at the well head. Therefore, the cable system of drilling with a dry hole is better adapted for prospecting work, as it gives most data as to the formations passed through. Once a field is located, and one can estimate the depth at which the " pay " and any water sands will be encountered, development work can proceed with the rotary machine, in case it is otherwise adapted for use in that field.

Rotary System. — The rotary drilling machine, as used for oil-well drilling, consists essentially of the following units:

(1) A drilling stem (usually of 4- or 6-inch pipe), to the lower end of which is attached (2) the bit or cutting tool, provided with a hole

for the circulation of water. These are rotated by means of (3) a geared turntable provided with grips. The power required is usually supplied by a gas or steam engine, but in some cases by an electric motor. A constant circulation of a thin mud " slip " is kept up by a special pump, the " slip " passing down through the inside of the drill stem and the hole in the bit at the bottom of the hole, and up the outside of the stem. This not only keeps the bit cool, but carries the pulverized material up out of the hole.

The heavy column of water kept in the hole at all times prevents the sides from caving, and water and gas sands need not be cased off, as must frequently be done when cable tools are used. This saves not only time and trouble, but also the added expense of extra strings of casing, and it obviates the necessity of reducing the size of the hole.

In steeply inclined, hard beds, where a great deal of trouble is caused by crooked holes, a straighter hole may be drilled by the use of the Canadian pole-tool system, as it has a series of rods extending to the surface instead of a cable.

Where there are alternating hard and soft strata, while the cable tools might, under favorable circumstances, drill in less time, the danger of accidents in the soft strata, the delay in handling caves and the danger of casing trouble sometimes indicate that the hole should be drilled entirely with a rotary machine, a special bit being used for the harder portions. The recent development of heavier equipment and of such bits as the Sharp and Hughes hard-rock bit has extended the use of the rotary machine into a number of such fields. It is now claimed that the rotary system can be used advantageously in any of the California fields. However, the standard cable-tool system is still used widely, even in those fields, and possibly in others where it could be replaced to advantage by the rotary.

But in other fields, notably the unique Tamasopo reservoir of Mexico, the danger from blow-outs and the difficulty of handling are much reduced by the heavy column of mud in the rotary method.

In general, it may be said that the rotary is more expensive than the standard for shallow wells and very deep wells, and less so for intermediate wells, when both are operating in fields where conditions are otherwise fairly well balanced. Deep wells have been drilled with a rotary in California, landing 10-inch casing at a depth of 4000 feet.

The following table, summarizes the advantages and disadvantages of the two systems. The wise operator or superintendent knows his field so well that he can give each of these various fac-

tors its proper weight, and adopt the system best suited to the conditions. There is still enough prejudice among practical men, who have become more accustomed to one system or the other, to make their judgment in some of the new fields open to question.

STANDARD SYSTEM

Advantages

1. Adapted to relatively hard formations, as it can be used for the hardest rock, even in considerable thickness.
2. Lower labor and fuel costs per day.
3. First cost of rig less than for the rotary outfit.
4. Less water required for drilling, which is an advantage in arid regions.
5. More drillers available in some fields, although this is becoming less true.
6. Less time lost in prospecting work, and in testing possible "pay" horizons, than with the rotary method.
7. Gives more information as to the formations passed through, and is thus better for prospecting.
8. Less cost per foot for relatively shallow wells, and for very deep wells.

Disadvantages

1. Not adapted to soft, caving formations.
2. More time consumed in drilling, especially when under-reaming is made necessary by caving formations.
3. More delays and fishing troubles in soft strata.
4. When there are many water sands, it is hard to carry a large hole to a deep pay sand, and may even be impossible.
5. Greater cost per foot for moderately deep wells.
6. More casing necessary to handle caves and water sands.
7. Liability of getting a crooked hole in soft formations.
8. Difficulty of controlling heavy pressures and greater likelihood of blow-outs.
9. More danger from dropped, "frozen," or stripped casing.

ROTARY SYSTEM

Advantages

1. Faster drilling in soft strata.
2. Less trouble from caving and water sands.
3. Less casing used in soft formations with water and gas sands.

4. Straighter hole in deep drilling in soft formations.
5. Less danger from casing trouble.
6. Can handle alternate hard and soft formations, with less danger of accidents than cable tools. This is made possible by the new bits and heavier rotary machines.
7. Can carry a large hole deeper.
8. When " drilling in " it is easier to control high gas pressure and prevent blow-outs.

Experience in the Mexican fields has proved that the better method of drilling into a heavy pay (when the depth is known) is with cable tools and a hole filled with water, since the cable tools, with their flexible cable, are more easily blown out of the hole than the rotary tools which are held down to the bottom by the inflexible drill stem. The well is controlled by a heavy valve after the tools are clear of the hole.

Disadvantages

1. Very slow in hard strata.
2. Greater daily labor and fuel cost.
3. Limited trained labor supply in some fields.
4. More necessity for cementing.
5. Greater cost per foot for shallow wells.
6. Does not show up smaller oil and gas pays, and important reservoirs may be passed through in prospecting.
7. More water necessary, a drawback in arid regions.

Comparative Costs and Drilling Time. — There are very few fields in which the comparison between the standard and the rotary systems of drilling is a difficult one. In territory to which the rotary is adapted, the cost of drilling with standard tools is abnormally high; and in fields to which the standard system is adapted the rotary is unduly expensive. Regions that are strictly intermediate are rare.

While average drilling costs may be given for certain districts, Individual wells in such districts may cost 50 to 100 per cent more, owing to accidents or unusual underground conditions. In several California districts there is enough drilling by each method to make comparative costs available. These cannot be applied elsewhere, however, as conditions are dissimilar.

These averages do not show any remarkable difference in the cost of drilling by the two systems; but this can be accounted for by the fact that conditions differ greatly within short distances in some of

these fields, thus keeping the question of relative advantage pretty evenly balanced between the two systems. But the recent improvements in the rotary system, such as improved bits and heavier machines, have increased its use and lowered the cost of drilling by this method in the California fields.

These improvements have at the same time helped drillers and operators in the Texas and Louisiana fields, where the rotary system was first developed. In the Caddo and Gulf Coast fields there is no question as to its being the best method, and in these fields the drilling time is much less and the cost per foot is much less than in California.

The cost of drilling by both systems in the Mexican fields is relatively high, considering that conditions do not differ much throughout the field, and drilling and casing procedure is more or less standardized. This higher cost is due to other factors, among the most important of which are transportation and duties, the higher cost of the extra-heavy materials necessary for the large wells, together with high labor cost, the cost of maintaining camps for the men, and unforeseen delays arising from the disorganized state of the country.

The drilling of isolated wells, in the early development of a property, always costs more than that of later wells. This is because certain items, such as the entire cost of rig, casing, fishing tools, etc., must be borne by one well, while as the property develops, much of this is used more than once, especially the material recovered from dry holes. This also applies to other expenses, such as part of the cost of road building, rights-of-way and other expenses peculiar to each case.

Modifications. — Various modifications of the two principal systems of drilling have been developed, and may be classified as follows:

(*a*) Combination system.
(*b*) Circulating system for standard tools.
(*c*) Portable rigs.

(*a*) *Combination system.* — In the California fields the two systems are sometimes combined, one part of the hole being drilled by the rotary while another part is drilled by cable tools. In some wells in California, the standard tools are used only for drilling into the oil sand, in order that it may be better observed and properly managed. An attempt has been made to rotate the casing, which is fitted with a special shoe, at the same time that drilling proceeds with

cable tools; but this has not come into common use even in the California fields.

The combination system is particularly adapted for use in the Mexican fields, where it is used in competition with the cable-tool system. In these fields the greater part of the hole is in easily drilled gumbo and marls, and the remainder in sandy limestones and lime sandstones. The procedure is to cement the larger casing at about 2000 feet with the rotary system, and to use the cable tool to complete the hole and drill it. The combination system has the reputation, in these fields, of averaging quicker completion time, and of having less casing trouble but more cementing trouble.

(*b*) *Circulating system.* — There is a recent improvement in the cable-tool system which has some of the good points of the rotary. This is the "circulating system" (Paine and Stroud), by which circulation of water in the form of a thin mud slip, similar to that used with the rotary, is maintained through a special circulating-head down through the casing and up the outside of the pipe. This is to prevent caving, to shut off gas sand by keeping a pressure on the sides of the hole, and also to mud up the walls. A wire cable is used, of course, and part of the drillings are carried up to the surface with the circulating water. However, the drilling is so slow that the method will probably never come into wide use. Its field would seem to be where the strata are hard and there are many water sands.

(*c*) *Portable drilling machines.* — In comparatively shallow territory, a portable machine of the cable-tool type is generally used, particularly in the Mid-Continent fields. It has the advantage of being easily moved about in wildcat country where roads are bad, in less time than is necessary to move a heavy regulation outfit. It is, however, not adapted for handling heavy strings of casing without additional reinforcement. It cannot, therefore, compete with a derrick rig, except for shallow wells, and for cleaning and deepening where no new casing will be required. The time saved in moving and erecting it, and the comparative cheapness with which such a machine can put down shallow wells, adapt it for developing most territory where the operator is positive that his farewell sand will not exceed 1200 feet. Beyond this depth the cost per foot, as compared with the standard rig, increases disproportionately. Drilling machines of this type were largely used in developing eastern Stephens and Nowata Counties, in Oklahoma, and Chautauqua County and other shallow fields in eastern Kansas.

These machines are in principle the same as the standard outfit, except that they are mounted upon a wheel base, and can readily be moved from place to place, a mast taking the place of the derrick. They cannot handle long, heavy strings of pipe readily; hence their principal value is in their adaptation to the following purposes.

1. Rapid completion of the drilling of properties whose sands do not lie deeper than 1200 to 1800 feet.

2. Drilling into the sand after a hole has been drilled by a rotary outfit. In this way a machine can be kept on a lease and readily moved around from well to well, as required.

3. Prospecting work, where drilling is not too deep, but where roads are bad for bringing in heavier outfits, especially boilers.

Methods of Casing. — There are several methods of casing, the choice between them depending upon water conditions in the strata, the system of drilling employed, the character of the formations and the depth of the hole.

In drilling by the rotary system, the hole is usually all of one size and but one string of casing is used (except for a short surface string); the sides of the hole are " mudded up " as drilling proceeds, and caving beds and minor gas and water sands are shut off in this way. However, bad caving and large flows of gas and water must sometimes be cased off and cemented, and the hole continued with a smaller size of casing. The casing used in such circumstances is heavier than that which is used in hard rock fields, as it must resist a heavy collapsing strain from the outside.

In drilling by the cable method, water sands must be cased off to prevent them from flooding the lower oil sands. This should also be done in the case of upper gas sands. Caving formations must be cased off to avoid catching the tools and thereby sometimes losing the hole. This means that several strings of casing must be seated at various depths.

In comparatively shallow territory, a hole is sometimes drilled " wet "; that is, water sands are not cased off, and the tools are run in a hole in which the water stands high. Drilling is usually done with a steel cable, as the water offers more resistance to manila cable. In such cases, when the sides of the hole stand up well, casing is not put in until the hole is finished. The practice of drilling " wet " with cable tools is not adapted to any but hard rock fields; even then the time and expense saved in casing rarely justify the slower drilling in a wet hole. It is unwise in case of wildcat wells, as the weight of

water may suppress indications of the oil, gas or water content of the beds penetrated. The last part of the hole is drilled wet in the Mexican fields, as a safeguard against the high pressure and volume at which these wells come in.

When the hole caves badly, it is advisable to keep the casing " following down " not far behind the drill. In such cases it is customary to drill a smaller hole and then enlarge it by an under-reamer which goes ahead of the casing. Sometimes the formations are soft enough to permit dispensing with the under-reamer, by fitting the casing with a special shoe which reams out its own hole behind the smaller drilling bit. The weight of the casing is frequently sufficient to move it; otherwise an hydraulic jack is used to force it down.

In badly caving or soft formations, such as those found in parts of western Canada, where the casing is liable to become fast, or, in the language of the drillers, to " freeze," it has been found advisable to use inserted-joint casing. Not only are the joints stronger, but the friction in raising or lowering the heavy strings is lessened by eliminating the heavy screw collars, which project beyond the pipe in the usual type of casing.

Another system of casing, occasionally used for comparatively shallow wells (up to 500 or 600 feet deep), in soft unconsolidated formations in California, is the " stove-pipe " method. A similar method is used in the Baku fields in Russia. Riveted pipe in short lengths is used, one length telescoping into that ahead, while the string is forced down by hydraulic jacks as the hole is drilled, or " washed " down by working with the walking-beam a bailer-like device called a " mud scow."

This riveted casing is sometimes used as drive pipe, in drilling the upper portion of deeper wells which are continued with the usual type of casing. In this case, the casing is driven by blows from an attachment to the drill stem.

In drilling in wildcat territory, where the number of water and gas sands is unknown and the depth of the oil sand uncertain, the ultimate depth of the hole cannot be known, and therefore one must start with a larger size of casing than that which will probably be used for later wells when the field is developed. Pioneer wells in some pools have failed to discover oil because the hole was so small that it could not be carried deep enough to penetrate the main oil sand. In some cases, this sand was later discovered to be only a few feet below the point reached by the early well. Wells in the Mexican

fields are commonly started with 15½-inch casing weighing 70 pounds to the foot.

Some wells in the Turner Valley district, near Calgary in Alberta, have been started with 18-inch casing. In California, even larger casing has been used.

The Canadian pole-tool method, and the methods evolved from it in Russia and Roumania, are variations of the churn drill, except that instead of a cable, ash- or steel-jointed poles are used for lifting and dropping the bit. The string of poles and the bit are given a more definite rotating motion than in the case of cable tools. This is claimed by its sponsors to result in straighter holes when the formations are much folded or tilted.

One authority has summed up the comparison by saying that the rotary rig is an excellent machine for making a hole, but the cable rig is the best for making an oil well. That is to say, the cable rig should be used whenever possible, but in places or conditions which preclude this, the rotary should be used with the greatest possible care and expert supervision.

In soft, unconsolidated formations, with beds of caving shale and gumbo, and so-called boulders which may catch the cable string of tools, the rotary method is the only feasible one.

Keeping the Log.[1] — One of the greatest needs at present is good logs. Every log should give the top and bottom of every sand which carries gas, oil or water, in addition to giving the distance from the top of the sand to the level where the flow into the well is found. It should also give the distance from the top of the best-known limestone or coal bed, and from that of the nearest widely found limestone, coal or red bed, to the main producing horizon; and this measurement should be taken with a steel line in order that the dip may be properly calculated. Where beds are very lenticular, a more complete record should be kept of changes in the strata, as the correlation of such beds is a difficult matter.

A distinction should be made between the preparation and care used in logs of wells in new districts and logs of wells in a producing field. All wildcat logs should, speaking generally, have closer attention than those in production. Where conditions warrant it, a geologist should be retained for the purpose of minutely examining the characteristics of each stratum, taking samples at each change of formation, and taking every precaution necessary for the completion

[1] Ambrose, A. W., U. S. Bureau of Mines, Bulletin 195.

of a log which will be of distinct value to those who will use it. Where no geologist is employed, the result is all too frequently a log whose reported depths to formations are in multiples of 5 feet, and whose strata are reported monotonously as "shale and shell." Measurements by estimate from strings on the cable should later be corrected, when a steel line measurement shows the cumulative error.

When a company is drilling in a new field, and can afford it, a resident geologist should be kept in the vicinity of each active pool, to supervise and interpret the logs of all wells, as is done by the larger companies in Mexico. In certain fields this might be done by the state geological survey, which might act as a clearing house for such information, and advise upon such questions as the correlation of certain beds, probable depths, dips in certain directions, and so on. The same service could be performed by a competent man whose salary could be paid by a local association of producers.

The elevation of the mouths of the wells should be obtained, for the purpose of calculating the dips; and outcrops in the vicinity should be observed and measured, so that the dip beyond the edge wells may be ascertained. Without these three sources of information the best results cannot be obtained.

How Deep to Drill. — Before drilling is begun, it is advisable to obtain as much knowledge as possible of the formations through which the well will pass. This may be had in either of two ways:

1. By a study of the well logs of the nearest development drilled in the same formations.

2. By a study of the formations at their outcrop, if this is possible, to determine which is the most promising for oil or gas production.

From this information, the "farewell" sand should be decided upon, and its approximate depth determined by a measurement of the dip of the surface formations along a line from the nearest point of outcrop.

The determination of the depth at which to abandon drilling, when oil is not obtained at the expected depth, is a matter of very great importance. One hears many tales of oil reached when drilling was about to be abandoned. Besides knowing which horizons should be penetrated, it is important to know when the chances have become hopeless for a given horizon. This is one of the practical reasons for taking steel-line measurements on certain key horizons. The depth from the key horizon to the producing sand known in neighboring wells is called the interval. The depth to drill, then, is the sum of the

depth from the surface to the key horizon, plus the interval, plus the margin of safety. In some fields, drilling is continued for 100 feet below what is thought to be the bottom of the sand, before the well is abandoned.

Even when a well produces oil, if there is no water, one should drill a reasonable distance into the underlying shale or limestone. The distance recommended is generally 10 feet, but may be more or less, according to local indications. Below a thin shale member there is, not infrequently, more oil-bearing sand.

Where there is water in the lower part of the sand, as there frequently is, care must be employed to stop the drill at the proper point. There are some who habitually stop before there are any indications of water, for fear of reaching it, and others who proceed carelessly, and frequently drill too deep. If the pool is young and the pressure high, the driller should stop well above the water, leaving the deepening to the water to a later period; if the water is known, or suspected from analogy, to be encroaching to a serious extent, the sand should be warily entered. If, on the other hand, the pool is old and the pressure greatly reduced, and it is known that the water is not encroaching in the pool in question, the wisest course is to drill until some water sand is obtained, then to fill in for a corresponding short distance before shooting. This is possible only in those fields where the water is not under great pressure.

Under such conditions, it is desirable, rather than otherwise, that some water should be produced with sand " pay ", as this is usually a warrant that the full thickness of " pay " is being utilized, and that some neighbor is not getting the benefit of part of it. Where a well is on a small tract, or on the edge of a pool, and will therefore be operated on the beam or on some neighboring power, one may be more conservative as to drilling deep than where a power is available to give the wells as much pumping as is needed.

There are theoretical reasons for believing that there are larger reserves of deep gas than is usually supposed. The practice of discontinuing wells without competent consideration of the chances of success by deeper drilling is a serious loss in the long run. Thus, large areas have been considered " condemned " on the evidence of wells drilled to inadequate depths. Such drilling is a great deterrent to the testing of deeper sands, since later tests in the territory cannot have the advantage of possible production in the upper sands, and because the exact depth of the earlier tests may not be known.

The Fuel and Power Supply. — By far the greater part of the wells in the United States are drilled with a boiler and steam engine, using natural gas as fuel. Wherever gas can be obtained cheaply, it is the best choice. Many wells in the California, Mid-Continent and Mexican fields are drilled with fuel oil used under a boiler, as oil is relatively cheap.

The next choice for a fuel is coal; its desirability depends upon market conditions, upon the grade of coal available, and especially upon transportation conditions in the field. It should always be remembered that in many fields some gas is encountered in the wells on the way down to the oil sand; this gas can be used for the rest of the drilling in place of the fuel which has been used up to that time. For drilling wildcat wells at a considerable distance from the railroad, as in parts of Western Canada and the Mexican fields, wood is frequently used for fuel. Its heating value is not high, and it is relatively expensive compared with other fuels, when the latter can be obtained. Some few wildcats in the Southwest have been drilled with brush used as a fuel — principally mesquite and greasewood. This is only done as a last resort.

While the steam engine is by far the preferable form of power for drilling, on account of its flexibility, yet the gasoline internal combustion engine has been adapted by means of clutches to this class of work, as have also internal combustion engines using natural gas. While gasoline engines have been used from time to time, their use has spread only gradually and has been principally restricted to a few drilling machines and to the drilling of wildcat wells in sections where transportation of boilers and fuel is difficult. Recent improvements hold out promise of wider use. In order to increase the flexibility, and hence the use, of the gasoline engine, an electric dynamo and motor have been added to one type of drilling machine. Since the first cost of the equipment is high, and repairs cannot be so easily made at isolated locations, it will not seriously compete with the use of gas or other fuel under a boiler, except in unusual instances. However, where cheap electric power is available, as in some of the California pools, motors have been successfully used for drilling purposes. Crude oil engines are being tried in a small way.

In describing the work of cable drilling machines operated by electricity, as compared with those operated by steam generated from coal at Bisbee, Arizona, Notman found that electric drills could be

operated from 10 to 25 cents per foot cheaper than steam.[1] However, coal was very expensive in this locality, while electric power was furnished by the company's own plant at a price of 3.3 cents per kilowatt-hour. Such conditions are met in but few oil fields.

It is probable that both the internal combustion engine and the electric motor will be found better adapted to use with the rotary system of drilling than with the cable-tool system. At the present time, the California fields are the only ones where electricity has been used to a relatively large extent. It is more widely used in Butler County, Kansas, than in any other part of the Mid-Continent field.

Drilling Contracts. — Producer and contractor should invariably enter into a contract. The following form is one which has been used for deep drilling in Oklahoma. In deeper drilling in other fields, payments are sometimes made from time to time as drilling progresses. In some fields it is customary for a contractor to drill the well on a " labor contract " basis, the company supplying all material. The contractor usually guarantees completion within a certain time, and stands the expense of all fishing jobs. It is not unusual for the producer to pay a fixed price per diem for under-reaming.

DRILLING CONTRACT

THIS AGREEMENT, Made this.....day of....., A. D. 19...., between..... party of the first part, and ....., party of the second part.

WITNESSETH: That said part.....of the first part ha....covenanted and agreed with said party of the second part, its successors and assigns, that said part .....of the first part will drill for said party of the second part a certain well for the purpose of obtaining petroleum oil or natural gas, to be known as Well No..... on the farm of.. ... .in Sec....., Twp....., Rge..... .....County, State of.....

The material, machinery and appliances necessary for drilling and completing said well shall be furnished, and the work of drilling the same shall be done in the manner hereinafter specified, viz.:

A complete carpenter's rig of good quality (including wooden conductor), to be furnished by the part.....of the.....part (and all repairs on same while the well is being drilled, shall be made by and at the expense of said.....of the.....part).

All casing to be furnished by part..... of the.....part, at his own cost, risk and expense.

Boiler, engine, belt, bull rope, steam and water pipe and connections to be furnished at the well by the part..... of the.....part.

The expense of fitting up and connecting same to be borne by part.....of the .....part.

[1] Trans. Am. Inst. of Min. Eng., Vol. LII, page 444, et seq.

Fuel to be furnished at the expense of the part..... of the.....part.

Water to be furnished at the expense of the part..... of the.....part.

Oil saver and steel measuring line at the expense of part..... of the.....part.

All machinery, material and appliances furnished by said party of the second part, shall, at the completion or abandonment of said well be returned to said party of the second part in as good condition as when received by said part..... of the first part ordinary wear and action of the elements alone excepted.

The said part..... of the first part further agree.... to pay all expenses and furnish everything necessary to drill and complete said well except the articles and appliances herein specifically mentioned to be furnished by party of the second part.

The said well is to be drilled.....
the consideration for which shall be.....per foot.

The party of the second part shall pay party of the first part at the rate of.....
dollars per day of.....hours for all underreaming and delays of any kind caused on account of the second party — under-reamers to be furnished by party of the second part.

When the said well approaches the oil or gas bearing sand, the part.....of the first part shall notify the party of the second part, or its agent in charge of the farm or lease, and thereupon any further drilling and casing into or through the sand shall be requested by the said party of the second part or its agent in charge of the farm or lease, but the work in connection therewith shall be done by and under the direction and at the risk of the part..... of the second part.

If oil or gas is found in sufficient quantities to endanger the rig, material or equipment, part..... of the first part shall remove at.....own expense the fires and boilers to a safe distance from the well. All pipe and fitting made necessary by such removal shall be furnished by said part..... of the .....part.

When completed, unless prevented by too great a volume of oil or gas, the well shall be thoroughly " bailed " and " sand pumped " by said part..... of the first part until all drillings and sediments are removed therefrom and the well thoroughly cleaned.

No part of the contract price above mentioned shall in any event be paid until said well shall be completed to the depth above required. and delivered to the party of the second part, in thorough good order, free and clear of all obstructions.....
.....

The part.....of the first part agrees to begin the drilling of the said well within .....days from.....and prosecute the work actively and continuously, Sunday excepted) to completion .....

IT IS FURTHER AGREED, That time shall be the essence of this contract, and that in case the part.....of the first part shall neglect or discontinue the work of drilling said well for the space of.....days, such neglect or discontinuance shall of itself be a forfeiture of all rights and claim of the part.....of the first part under this agreement without any notice or demand by the party of the second part. The party of the second part shall have the right at any time after such forfeiture to take possession of said well and complete said well at.....own risk and expense.

After the drilling of the well should the party of the second part desire to torpedo and clean out after the torpedo, the first party agrees to do the work at.....
dollars per day of.....hours at risk of said second party.

It is hereby agreed that this contract shall be binding on the heirs and assigns of the parties hereto.

IN WITNESS WHEREOF, The part.....of the first part ha....hereunto set.....hand and seal and the party of the second part has caused these presents to be signed by its.....the date first above written.

WITNESSES: .....(*Seal*)

.....(*Seal*)

....(*Seal*)

CHAPTER XIX

EXTRACTION OF GASOLINE FROM GAS

The executive of any oil company which has no plant for the condensation of gasoline from casinghead gas should consider most carefully the advisability of securing such a plant. He should notice the variation in the amount of gasoline condensate in gas-well drips and in gas traps on oil wells, under varying conditions of temperature and pressure, in order to determine whether or not the installation of a plant is justified. The additional profit from gasoline may be sufficient to warrant the maintaining of old wells for many years after they would otherwise have been abandoned. However, as the market conditions in the various fields differ, as does the cost of the extraction of gasoline, evidence of gasoline condensate should be supplemented by (1) a gas analysis, and if this prove favorable, by (2) test runs in a small model field plant. These small test plants[1] are now made in portable form, so that they can be taken from one property to another. The amount of gasoline which can be extracted from casinghead gas by the compression method varies in different localities from 1 to 12 gallons per 1000 cubic feet of gas with 350 pounds pressure. In commercial practice, most compression plants produce from $1\frac{1}{2}$ to 3 gallons per 1000 cubic feet of gas, and are able to market from 50 to 80 per cent after the loss in weathering and shipping. Absorption plants extract from 0.1 to 1.0 gallon per 1000 feet of gas.

There are, as has been noted above, two main methods of recovering the gasoline from the gas:

1. Compression.
2. Absorption { mineral seal oil. / charcoal.

Compression. — The first method is the original one, and consists essentially of extracting gasoline by compression and cooling of the gas. It is best adapted to handling very rich gas in relatively small volumes, such as the casinghead gas produced along with the oil in

[1] U. S. Bureau of Mines, Bulletin 42, pages 91–110.

some oil wells. As each compressor unit is relatively expensive as to first cost and upkeep, and as the gas handled thereby is limited in volume, the gas must be sufficiently rich in gasoline to justify the method. Usually it does not pay to use this method, unless, with allowance for variation under different conditions, the gas is rich enough to yield 1 gallon of gasoline for each 1000 feet of gas.

Burrell[1] estimated in 1916 that a single unit plant, consisting of two gas compressors, gas engines, piping, cooling coils, storage tanks, housing, etc., cost from $9,000 to $10,000, and could handle at least 500,000 cubic feet of gas daily. It is probable that the same plant would cost $15,000 or more at the present time. The fixed charges vary widely and include interest on the investment, depreciation, plant upkeep, accidents, etc., all of which must be taken into consideration.[2]

In the Mid-Continent field, it is generally believed that a compression plant does not make a profit at the present time unless it operates upon a gas which is rich enough to yield at least 1 to $1\frac{1}{4}$ gallons of marketable gasoline per 1000 cubic feet. On the other hand, absorption plants can be profitably operated, under ordinary conditions, when the yield of gasoline is as low as 0.2 gallon per 1000 cubic feet, provided the daily production amounts to 1000 gallons or more.

The choice of the location for a plant operating by either method depends upon the following factors:

1. The gasoline content, as shown by analysis of the gas in the pool.
2. The probable life of the wells.
3. The quantity of gas available.
4. The market for gasoline, which is determined principally by the distance from a refinery where it can be blended, or from which low-grade naphtha can be brought for blending with the light gasoline produced.
5. The probable amount of fixed charges, calculated from the cost of the plant in that district and the data on expenses at analogous plants.
6. The range of gasoline prices in the past for the district in question, and the probable future course of prices, as judged by the

[1] U. S. Bureau of Mines, Technical Paper 57 and Bulletin 88.
[2] Westcott, H. P., Handbook of Casinghead Gas.

large annual increase in the number of automobiles and the expected advance in the price of crude oil.

7. The market for the residual gas from the plant, after the extraction of the gasoline.

8. The benefit derived from operating the plant as an adjunct to an oil property which is itself on a self-supporting basis.

9. The amount of the royalty or rental which must be paid to the well owners.

10. The feasibility of connecting the plant, after the abandonment of the original wells, with other leases in the district. Where this cannot be done, the entire cost of the plant must be borne by the wells with which it was originally connected.

11. The location, with respect to water, transportation facilities, and living conditions for the men. These are quite important in isolated and arid regions.

In the compression method, the common practice is to use two stages of compression. The first stage discharges at from 25 to 50 pounds, and the second at from 120 to 300 pounds per square inch. The gasoline finally produced is often higher than 88° Bé., and this necessitates its being shipped to a refinery for blending with low-grade naphtha, unless the blending is done at the gasoline plant. The blend is generally weathered later, before being sold. The lighter portion, ordinarily "weathered off," has been sold in high-pressure tanks for household illumination, and to a limited extent for the cutting of iron and steel, under the name of "gasol." Where the "gasol" is mainly butane, it is more uniform and satisfactory. One company is putting out this fraction for such commercial uses. Only large plants can undertake this saving, as any one group of wells, during its history, usually shows too rapid a decline in the yield of "gasol," a decline that is much more rapid than that of the gasoline content.

The pressure used in the second, or high stage, is governed by the gravity of the gasoline it is desired to produce. If too high a pressure is used, the very light gases are also extracted, and these are in turn easily lost by evaporation, in the weathering process. It is not customary to produce more than 150 pounds pressure in the second stage of the compression, yet this should be a matter of experimentation at each plant where conditions differ from those in other fields. For example, different gases produce different qualities of condensate, and in one case the gasoline produced may lose relatively little by

weathering, while the same compression on another gas will give a " wild " gasoline, which cannot be shipped without weathering. Again, there may be a limited local market for very light gasoline for special purposes, in which case the gasoline might be sold at a premium without blending. If this country develops an increasing market for the very light distillates which can be used for various purposes in the chemical industries, there will be a tendency to increase the pressures in the gas-gasoline plants in order to recover more of these products.

The gas from an oil well increases its proportionate load of condensable vapors as the pressure of the well declines with time. Moreover, the gasoline extracted becomes regularly heavier as the well ages. Casinghead gas which is too " lean " at high pressure may, therefore, become suitable later. Gas wells without oil, which are generally too " lean " at first, may become suitable for condensation when the pressure is greatly reduced. This applies more particularly to gas which is found in the same pool with oil.

In some pools it has been found that the best results are obtained by keeping a vacuum on the wells from which casinghead gas is being obtained. The degree of vacuum is a matter for individual experimentation in each plant. Various plants in southwestern Pennsylvania are using from 4 to 28 " points " (inches of mercury below atmospheric pressure). The vacuum should be gradually increased, as the pressure of the well falls, at a rate to be determined experimentally in each case.

Absorption Process. — Fortunately, another process has been developed. This is the absorption process, which makes it feasible to treat great quantities of gas rapidly, so that all the gas in a main line may be handled. This second method is used for relatively lean gas, and consists essentially in running large volumes of such lean gas through mineral seal or similar absorbing oil or charcoal. The oil or charcoal absorbs the heavier hydrocarbons in the gas. If the gas is afterwards to be sold for fuel or carbon black, and is sufficient in quantity, it has been found profitable to extract the gas even when the yield is as low as .12 gallon per 1000 cubic feet. This process is therefore of especial interest to gas companies. However a very large absorption plant has recently been built at Burbank, Oklahoma for casing-head gas.

Where compressors are needed to raise the pressure of gas for transportation, the gas should enter the absorbers after being com-

pressed. The oil, with its absorbed gasoline, circulates through a continuous still, where the gasoline is distilled off and is then condensed. The oil then returns to the absorbing apparatus. This is very long, in order that there may be ample opportunity for contact between the absorbing oil and the gas. There are vertical absorbers, in which the oil percolates through stones or loose metal, and absorbers built of horizontal pipes with baffle plates. The circulation of the absorbing oil is continuous, but the rate is adjusted according to the amount of gasoline to be removed from the oil.

Absorption apparatus can be installed to handle any desired quantity of gas, from a few thousand feet per day up to 20,000,000 feet per day; it handles large and small quantities to equally good advantage. This process is especially valuable when the gas product is to be transported in lines where rubber couplers are used, instead of welded lines. The gas made from the absorption process is " dry," and therefore does not deteriorate the rubber in the couplings.

In some cases a special refrigeration apparatus is used in conjunction with the absorption plant, to increase the efficiency of the process. In a few cases, refrigeration alone has been used to extract gasoline from the line gas.

Absorption with Naphtha. — Some large absorption plants use naphtha as an absorbing oil, instead of the usual mineral seal oil. Low-gravity naphtha is introduced into the absorbers and, as the gas is run through, the absorbed light gasoline gradually raises the gravity of the absorbing naphtha, until a mixture approximating commercial gasoline results. This is drawn off and sold. The chief advantage of this process is that redistillation of the oil is not necessary. Furthermore, there is no loss of absorbing oil. This method is recommended where there is a refinery so near at hand that naphtha can be piped constantly to the absorbing plant to replace that which has been used.

Absorption with Charcoal. — Where charcoal is used as the absorbent, the advantage of circulation, such as is used with the oil, is lost, and the process is necessarily an intermittent one. One of the three towers is disconnected from the gas as soon as charged, and the gasoline is then driven off by steam, after which further time is lost by cooling. This disadvantage, as well as the difficulty of reclaiming all the gas absorbed, has so far prevented the charcoal method from being widely accepted, with the result that it is still far less used than the oil method for absorption.

Choice of Process. — The decision as to which process is best adapted to each case, where the quality of the gas is intermediate, must depend upon various other factors. It is necessary to consider the probable persistence of the volume, the cost of each type of plant per unit of gasoline capacity, the familiarity of the men already in the organization with each type of plant, and the extent to which the gas will tend to become richer in the future, as the pressure goes off the field and the volume correspondingly decreases.

The utilization of casinghead gas for the manufacture of gasoline is best carried on as a secondary operation in either of the two types of companies listed below:

1. Natural gas companies having a market for their dry gas, or oil companies closely affiliated with such gas companies.
2. Oil-producing companies, with affiliated refining companies, which take the unblended gas-gasoline and blend it as a part of their general operation.

Methods of Marketing Gas-Gasoline. — There are three methods of marketing gas-gasoline at the present time:

1. Selling to a refinery for blending with low-grade refinery naphtha, in order to make a commercial grade of gasoline.
2. Buying the low-gravity naphtha for blending at the gasoline plant, which then markets its own gasoline.
3. Selling the product without blending, for special purposes. There is a small, but expanding market for the light absorption gasoline in the chemical industries, as well as for aeroplane fuel.

Provisions for Royalty. — Since the main line gas may be run through a large absorption plant without paying additional royalty to the original landowners, beyond that paid for the gas wells as such, most absorption plants have this additional advantage over compression plants. As wells come in on new gas leases, this advantage will probably disappear, owing to the gradual introduction of special clauses in the new leases.

In new oil leases there are usually clauses determining the amount of payment for the gasoline extracted. This may be a royalty to be paid on the gasoline extracted, and may or may not be at the same rate as the royalty on the oil. Other leases provide for the payment of a fixed rate, in cents per thousand cubic feet of the casinghead gas consumed, without reference to the amount of gasoline produced

therefrom. The most common method of all is to fix a price for the casinghead gas "used off the premises," regardless of its amount.

In the case of old leases made before the extraction of gasoline was contemplated, a supplemental agreement has usually been mutually agreed upon, in one or the other of the two ways just mentioned, although there is no judicial decision, known to the writers, determining that such royalty or rental must be paid or, if so, in what way. The three cases that govern extracting gasoline from gas are the following:

1. Locke *vs.* Russell (W. Va. 1915)[1], in which it was held that payment for casinghead gas used for gasoline extraction was not to be governed by the ordinary provisions for gas-well rental;

2. Prichard *vs.* Freeland Oil Company (W. Va. 1917)[2], in which it was held that commercial gas, sold from a shallow sand in a well that produced oil in a deeper sand, was to be governed by the gas-well rental clause;

3. United Natural Gas Company *vs.* Alum Rock Natural Gas Company, (Venango County, Pa., 1917), in which it was held that a gas-transporting company, which had contracted for gas from certain wells, was entitled to the gas as produced, and therefore containing the gasoline vapor that was present and which the transporting company was removing by absorption. The producing company was enjoined from erecting its own absorption plant. This case was never carried to a higher court. These three decisions do not directly indicate what would be the outcome if an ordinary casing-head gas compensation case should be adjudicated.

[1] 84 Southeastern 948.
[2] 93 Southeastern 871.

CHAPTER XX

THE MEXICAN SITUATION[1]

Introduction. — The production of oil in Mexico is closely related to the industry in the United States, for the following reasons:

1. Mexico borders upon the United States.
2. Mexican oil is largely refined and marketed in the United States.
3. The majority of the producing companies in Mexico are controlled in the United States.

Mexican wells have always been unusual in the enormous size and persistence of their flush production. This flow has continued with little or no decline until suddenly the well has " gone " to salt water. The markets of the United States have often been affected by a " flood " of Mexican crude oil, and if Mexican imports should be materially reduced, our markets would experience a period of marked and possibly difficult readjustment. Hence, anything which affects the Mexican situation must also affect the oil industry in this country.

Imminence of Failure of the Present Producing Pools. — As has already been predicted by several writers in recent papers, the producing areas in the so-called " Southern fields " in the Tampico Embayment, have only a limited oil reserve. These areas are being " pulled on " by every pipe line in that region, and the length of time until they are drained is the important element determining how long the present large daily oil shipments of these companies can continue. However, this is not the whole story, and Mexican oil will continue to be a large factor in the market for a long time after the areas mentioned above have been drained. The past and present producing fields will be discussed separately, in order that we may establish a basis for comparison, the only method by which underground reserves can be estimated in these fields.

[1] Published as a paper on the " Mexican Oil Fields," by L. G. Huntley and Stirling Huntley in the Bulletin of the American Institute of Mining and Metallurgical Engineers, September 1921.

Method of Computing Reserves. — The method used is one of comparison with the Tepetate-Chinampa Pool. In that pool, the oil-water contact was originally encountered at 2250 feet below sea level. The pool had an area of 625 hectares above the original salt water line. The average height to the top of the reservoir at all points, was 173 feet, giving total cubic contents of the dome above salt water of 11,632,500,000 cubic feet. This consisted of cavernous limestone containing oil, of which 126,000,000 barrels were estimated to have been produced at the time of depletion. Thus, each 90 cubic feet of limestone produced one barrel of oil. In the following estimates this saturation factor has been used in computing the oil reserves of the proven areas still underlain by oil. It could not, of course, be used in regions in Mexico where the Tamasopo limestone of this general character was not the reservoir.

Producing Areas. — *Dos Bocas.* The first of the large wells so characteristic of the Southern fields in this region was drilled in 1908 at Dos Bocas (Fig. 25). It ran wild for two months, and at the end of that time it yielded an increasing proportion of hot salt water, finally producing salt water only, which it still yields. Several smaller neighboring wells drilled previously were flooded with salt water as a result, and the pool ceased to produce. There is thus no history of production upon which to base comparisons with other fields. Dos Bocas is the most northern of these domes which lie along the crest of the main fold intersecting the coast at this point. The Aguila Company has recently completed a good well in San Geronimo, several miles southwest of Dos Bocas. As the producing horizon was encountered at 2294 feet below sea level, it seems probable that this well is located on the southern end of the Dos Bocas area. This is also borne out by the fact that the well produces oil of 14 gravity, while the field to the north and south produced oil of 19 gravity or better, indicating that this was a pocket of oil cut off by a body of hot salt water.

Tepetate-Chinampa. The initial large well drilled on this structure was Juan Casiano No. 7, drilled in 1910. This well produced from the pool without the competition of other companies until 1917, when several other pipe lines were completed. Thus the Huasteca Petroleum Company shipped approximately 85,000,000 barrels of oil from the pool, out of a total of approximately 126,000,000 which the pool had produced at the time it was finally flooded in 1920. The salt-water table moved up the flanks of the structure with re-

markable regularity, as the oil was drawn off. Starting from the 2250-foot contour below sea level, it moved gradually up to the crest, where the pay formation lay at an elevation of approximately 1800 feet below the same datum plane. The estimated area originally underlain by oil was 625 hectares, and the vertical height of the reservoir, at its point of greatest thickness, was 350 feet.

Amatlan-Naranjos-Zacamixtle Pool. The next independent pool south of the Tepetate-Chinampa pool is cut off from the field to the north by a sharp saddle or fault, and is separated from the Cerro Azul pool to the south by a low saddle which is also probably accompanied by faulting. While there are several domes along the crest of this reservoir which may be separated by faulting, the fold is here considered a single producing unit. Up to January 1, 1922, this district had produced approximately 150,000,000 barrels of oil. On the southern end (Zacamixtle) this depletion was more rapid than in the north, because of low porosity.

Cerro Azul — Toteco Pool. The crest of this structure reaches a considerably higher vertical elevation above the salt-water table than do those structures toward the north which have just been discussed. The highest contour in the Cerro Azul — Toteco Pool is apparently 1290 below sea level. The estimated area is approximately 1350 hectares, with a vertical oil column of 450 feet. The greater vertical height of this structure represents a correspondingly greater cubical content per hectare. By comparison with the Tepetate-Chinampa field, it is therefore estimated to contain a reserve of 150,000,000 barrels on January 1, 1922, making allowance for large amounts of gas in the reservoir of Toteco. There have already been produced about 60,000,000 barrels of crude oil, the greater part of which has come from the Huasteca Petroleum Company's well No. 4, in Cerro Azul, which was drilled in 1914. At the present time there are only three companies represented by leases and wells in this pool, although other claimants exist and may possibly obtain representation through title litigation, as frequently happens in many of these tracts. Oil is purchased from these companies by others having outlet pipe lines.

Potrero Del Llano — Alazan Pool. After producing approximately 117,000,000 barrels of oil, this pool finally yielded little but saltwater in 1917. Since that time, however, by "pinching in" old wells and drilling strategic locations, a considerable daily production has been worked up and is still maintained (January 1, 1922).

The highest producing contour in this pool was about 1750 feet below sea level on the Alazan end. More or less emulsified oil is produced from these " stripping " wells, to which have been added several wells drilled farther South in Cerro Viejo.

Tierra Blanca — Chapapote Pool. The first well was completed in this pool in May, 1921, and there is therefore no history of production. The Tamasopo lime lies at approximately 2000 below sea level in this well. In case the general salt-water level is the same on this fold as in the pools to the north (2150), the amount of oil to be obtained is relatively small; however, this remains to be determined. The territory is controlled by one company (Huasteca Petroleum Company), and it will therefore be a non-competitive pool.

Alamo Pool. The producing formation in this pool is a limestone some distance above the Tamasopo. Several " pays " are encountered, and at least two distinct grades of oil. Salt water has seriously invaded the small producing area, and the wells were " stripping " approximately 7000 barrels per day during a part of the year 1921. The pool has produced about 35,000,000 barrels of oil, but probably without affecting the nearby Tierra Blanca reservoir.

The Alamo pool is also a non-competitive pool, being controlled by the Penn-Mex Fuel Co.

Molino Pool. One well on this tract has been drilled into a pay reservoir in the Tamasopo limestone, at a depth of 2710 feet, and is thus the lowest large producing well in the Tampico Embayment. Its production is rated at 20,000 barrels per day, or more, but it produces a very heavy, viscous oil of about 11 Bé. gravity, which it has so far been impossible to pump to the coast. It is apparent that conditions are more complex in the Tuxpam River district than in the region to the north. A well recently drilled, by the same company, on the Zapotal tract, south of the river, showed some light oil in what is apparently the San Felipe series above the Tamasopo. It was, however, drilled deeper into the salt water and abandoned.

Panuco River Pools. These areas lie along the crest of a broadly plunging arch, and produce both from the San Felipe and the Tamasopo formations. While locally there seems to be a general salt-water table below which no oil will be found, yet the porosity of the lime in any particular area seems to be the main factor in determining its productivity. Neither the Panuco nor the Topila districts have been finally delineated by dry holes, and there is good reason to

believe not only that they will be extended but that new areas will be brought in along the broad crest.

Summary of Mexican Fields. — The value of any comparison of leases located on the crest of these folds depends upon the amount of oil which the owners of such leases, by means of their pipe lines and organization, can ship and sell during the time the total amount of oil is being depleted by the various companies producing from the same pool. Also, certain wells at the extreme crests of the reservoirs are found to continue producing for long periods when " pinched in," after the field as a whole is flooded. Companies controlling such wells have a valuable asset which may in the end give them better returns than the original wells.

After the Chinampa pool was drained, several wells located at the crest were able to " strip " substantial amounts of oil by " pinching " the wells in, and this is also being done at Amatlam, Potrero, and Alamo. Meanwhile, the Panuco River fields to the north have not been circumscribed by dry holes, and they continue to produce substantial amounts of oil, with the probability of increase in the future, both in number and in area. This may be shown as follows:

Daily production by fields early in 1921, *before the market decline*

Panuco River fields	145,000	barrels per day
Amatlan-Naranjos-Zacamixtle	400,000	"
Cerro Azul — Toteco	30,000	"
Alamo	10,000	"
	585,000	"

Estimated daily production by fields, January 1, 1922

Panuco River fields	145,000	barrels
Tepetate-Chinampa (stripping)	10,000	"
Naranjos-Amatlan-Zacamixtle (stripping)	20,000	"
Cerro Azul (three companies)	350,000	"
Tierra Amarilla (stripping)	10,000	"
Potrero-Alazan (stripping)	10,000	"
Alamo (stripping)	7,000	"
Total	552,000	"

Cerro Azul and Tierra Blanca, are estimated to have a reserve capable of yielding an average of 200,000 barrels for 571 days, and that they will produce at the combined rate of 350,000 barrels per day at the time of their being finally flooded. They should then in their turn be able to strip 10,000 barrels or more per day each from

wells on the crests. While it is impossible to say how long this stripping can go on, there is good evidence that such wells will be long-lived, as they are probably fed by oil working up the flanks of the structure over the entire former producing area. Much of this oil must have been cut off by the sudden flooding of the pools, and will now be largely available to such strategically situated wells as those mentioned. This will allow one to estimate that after all the southern pools have been flooded, there will still be a production in the Mexican fields of 250,000 barrels per day in April, 1923.

New drilling in the Panuco River field may be expected to increase production there. This alone is a sufficient amount to be a considerable factor in the oil market, particularly the fuel-oil market. Meanwhile it can be assumed that prospecting will probably have extended the producing areas in the Panuco River district and those to the south and west of the Alamo. In the latter region there is good evidence indicating that there will be found pools of relatively light oil in sand and limestone formations above the Tamasopo, as well as in the latter formation itself. The probable pools yielding from reservoirs above the Tamasopo will undoubtedly have smaller wells, which will produce over a longer period of time in comparison with the large Tamasopo wells to the north. It is even possible, if later and higher prices warrant it, that this region may see pumps installed for the first time in Mexico.

Possible New Fields. — The geological evidence in favor of developing other oil-producing districts in Mexico, in the next few years, will be discussed in the following paragraphs.

The main districts in which prospecting is being carried on will be discussed separately in their relation to the general geological conditions found in the Tampico Embayment.

They may be listed as follows (Fig. 25):

(*a*) Area north of the Tamesi River, towards the international boundary.

(*b*) Panuco arch.

(*c*) Tempoal Valley.

(*d*) Upper Tuxpam River Valley.

(*e*) South of the Tuxpam River.

The Known Reserves. — The present reserves in producing fields may be shown as follows:

Cerro Azul — Toteco	$150,000,000	
Tierra Blanca	50,000,000	
Panuco River pools		
"stripping" old pools		
(These areas have not been limited and seem capable of considerable extension)		
Total	$200,000,000	Plus

These amounts disregard later recoveries from the same areas through stripping wells, as the factor used in the calculations was derived from the data in the Tepetate-Chinampa area, which excludes later recoveries:

GEOLOGICAL FACTORS

Oil-Producing Horizons. — Up to the present time, practically all the oil from the fields in the Tampico Embayment has been produced from porous limestone near the top of the Tamasopo limestone, or from that limestone itself. The limestone is not porous " per se " but has been channeled, probably both by solution at a time of emergence in some areas and by underground water circulation, apparently promoted by the igneous intrusions of late Tertiary age, which are common in the field. Such cavities and channels are filled with oil on the crests of some of the main folds in the region, and, as would be expected, these spaces are filled with water down the dip on the flanks of such folds, and in the basins.

The large wells, however, are entirely dependent upon the voids in the limestone, and as these voids are apparently greater where associated with the basaltic rocks found in certain parts of the region, it would seem to follow that where such intrusions were absent, or infrequent, the limestone would be less productive, or non-productive. These conditions seem to prevail in the Tempoal Valley and also to the north of the Tamesi River toward the Rio Grande, where intrusives are not only relatively scarce, but in most cases are older than those to the south. Thus, while a few seepages exist north of the Tamesi Valley, and also in the Tempoal Valley, as a rule they are small and " dead " or merely veins of asphalt, as though leakage had long ago dissipated any possible underground accumulations of oil. The relative lightness of the oil in a few of these seepages, in comparison with those found along the crests of the reservoirs, may be accounted for by considering them as filtered through a considerable vertical column of shale.

Migration of Oil and Its Barriers. — The migration of all fluids in the sedimentary formations in the Tampico Embayment must have been, in general, westward, that is to say, from the region of higher pressures caused by depth on the Gulf side toward the mountain outcrop to the west. Any interruption of this migration must have been caused by the tops of folds, where the formations were sufficiently open to catch and retain the oil above the general salt-water body, or by fracture or fault zones which allowed its escape upwards to the surface, or by both causes. In the Tampico Embayment there exists a line of folding, flanking the coast, where both conditions exist. In fact, the groups of numerous live seepages at the surface were the first evidence of the fold to be noticed by the early exploiters of the field. Thus, any oil which passed this first line of folding could only be a remnant which could spill across the low places in the arch. As, immediately west of the crest of this first arch, the number and size of these igneous intrusions increase greatly, and as at each intrusion of basalt cutting through the upper formations there is an outlet for the leakage of any oil underground, the territory to the westward suffers from the following disadvantages:

(*a*) Less oil from migration.

(*b*) More dissipation, through having to pass a zone of intrusives in migrating westward.

(*c*) General synclinal conditions, which are favorable for water accumulation rather than oil, especially as the outcrop of the sandy San Felipe is open to infiltering waters on the west, at an elevation which would give it a high pressure.

(*d*) Proximity to mountain folding, which, with its accompanying heat and pressure, may have destroyed some of the oil reservoirs.

The Tempoal Valley thus suffers from the first three of these disadvantages, and possibly from the last as well. However, good structures on the flanks of such a basin may be expected to produce oil in relatively small amounts, even with the comparatively low " porosity " of the Tamasopo. The drilling carried on by the Pearson interests, at San Pedro, gave results which are evidence of what may be expected. In future such areas will be valuable, as the older, more prolific fields become exhausted, particularly since this is a high-grade oil.

The same considerations which were disadvantageous to the Tempoal Valley make the crest of the Panuco arch appear very

attractive for the future. In the Panuco field, and the surrounding district, the oil accumulations seem to be comparatively independent of local structures, which are not strongly marked, and seem to be governed by the local porosity of the limestone. If this holds true generally, there will be a great deal more oil produced from this region, as in the northern part of the embayment area. This broad arch constitutes the first barrier to the migration of oil from the east and the southeast. The oil found apparently increases in specific gravity from the Panuco River toward the north. That found at Los Esteros will barely flow.

Tamasopo Outcrops. — North of the Tamesi River, the Tamasopo lime outcrops in the Sierra Tamaulipas, as the result of an uplift which occurred during the later Cretaceous times. Thus, this outcrop has been a leakage zone toward which a wide area of sedimentary rocks have been draining for a much longer time than the period of leakage along the comparatively recent basaltic intrusives in the southern fields. The same conditions prevail in the Tamasopo, which bounds the Tampico Embayment to the west and south. Prospecting in such areas, between the first barrier to the east and the Tamasopo outcrop to the west, should be postponed till more favorable regions have received proper attention.

Upper Tuxpam River Basin. — (Fig. 25). From available surface evidence and from the drilling data collected up to the present time, one infers that the Dos Bocas — Alamo fold plunges steeply south of the Tuxpam River. This would necessarily leave a gap in the main line of folding, across which westward migrating oil could pass, to be caught further in by structural folds lying at the head of the embayment west of this gap. Since certain of these folds are well marked and have seepages and basaltic intrusives near their crests, they certainly give promise of favorable results when tested. These various features are less favorable here than on the structures along the present producing fold to the north and the strategic position of these southern folds is not as good, but they constitute the type of structures which will be tested in the future. The chances are good that they may develop fair-sized wells with a lighter oil than the present fields yield.

Area South of the Tuxpam River. — As stated above, to the south of the Alamo the evidence at the present time seems to indicate that the main fold plunges rapidly and will not connect directly with any fold in that direction. However, in the region between the

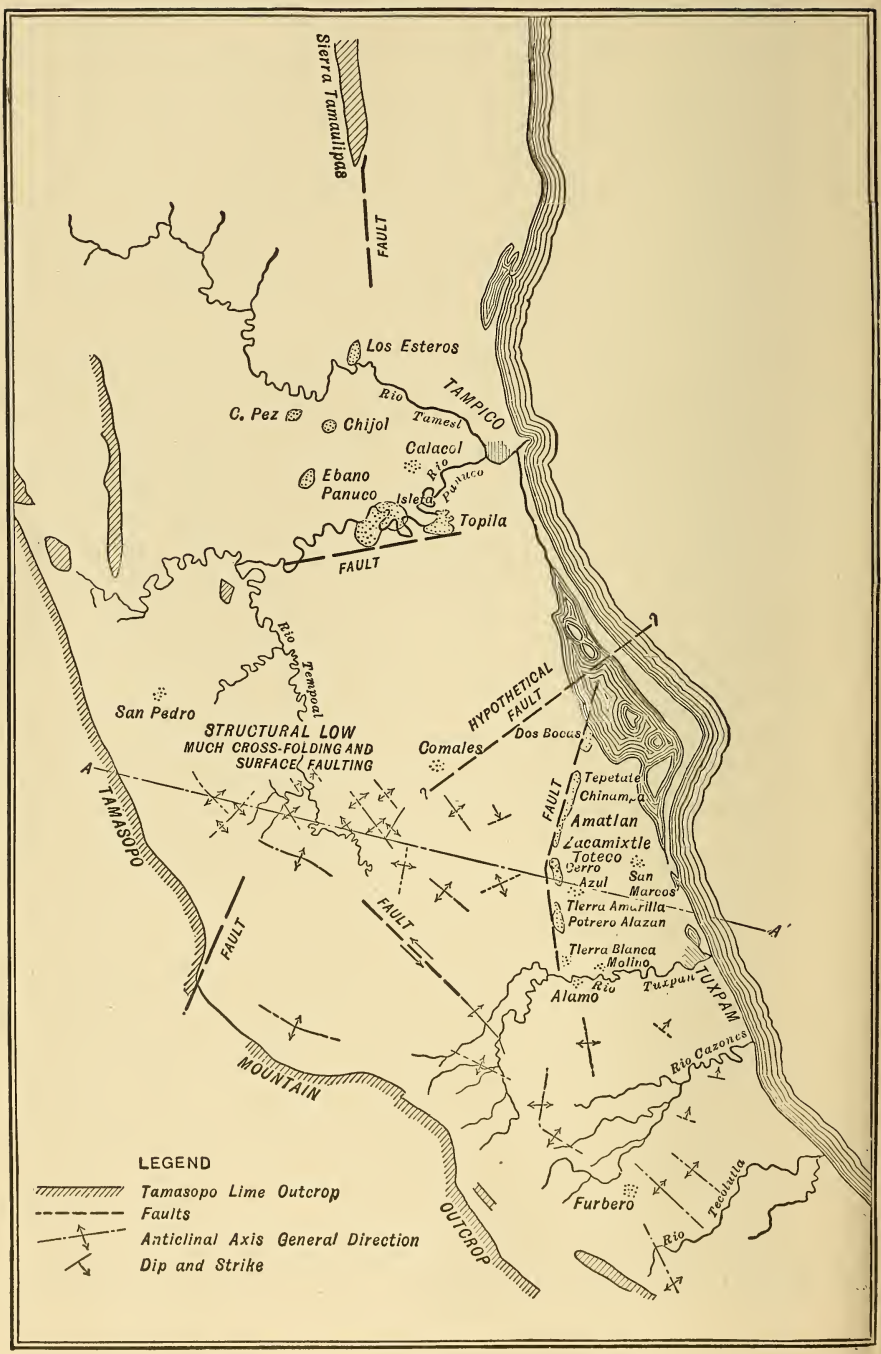

Sierra Tamaulipas
FAULT
Los Esteros
Rio Tamesi
TAMPICO
C. Pez
Chijol
Calaeol
Rio Panuco
Ebano
Panuco
Isleta
Topila
FAULT
Rio Tempoal
San Pedro
STRUCTURAL LOW
MUCH CROSS-FOLDING AND SURFACE FAULTING
HYPOTHETICAL FAULT
Dos Bocas
Comales
A
TAMASOPO
FAULT
FAULT
FAULT
Tepetate
Chinampa
Amatlan
Lacamixtle
Toteco
Cerro Azul
San Marcos
Tierra Amarilla
Potrero Alazan
A'
Tierra Blanca
Molino
Rio Tuxpan
TUXPAM
Alamo
Rio Cazones
MOUNTAIN
OUTCROP
Furbero
Tecolutla
Rio
LEGEND
Tamasopo Lime Outcrop
Faults
Anticlinal Axis General Direction
Dip and Strike

Fig. 25.

Tecolutla and Cazones Rivers, a relatively sharp fold is found, which brings the Tamasopo lime within drilling distance of the surface. This fold apparently constitutes the first barrier fold east of the coast in this region, and as it contains both seepages and recent intrusives along its crest, should constitute a good reservoir for oil. To the west and southwest of the barrier fold the Tamasopo is exposed at the surface, as is also the San Felipe. This territory cannot be considered particularly favorable, even though numerous seepages are found here close to the mountain front. The general strike of the folding changes abruptly in the vicinity of the Mautla River, bringing the Tamasopo close to the surface, along a fold with a northeast-southwest axis, which, together with the eastward limestone front to the south in the vicinity of Misantla, limits the Tampico Embayment in this direction.

In general, it may be predicted that any folds which bring the main reservoir rocks within drilling depth along a zone flanking the coast, and which at the same time do not have their reservoirs exposed, should be the best prospects for the development of oil production. The Furbero field produced oil from a volcanic sand, found in the Mendez shales, a considerable distance vertically above the Tamasopo.

Such folds, in this extreme southern end of the Tampico Embayment area, partake of the following advantages:

(*a*) Well-defined structures in a general region that has already produced oil.

(*b*) Presence of typical surface evidence, such as live seepages and recent igneous intrusions, which are accompanied, in the northern districts by "porous" Tamasopo limestone underground.

(*c*) Relatively shallow drilling depth at crests of reservoirs.

(*d*) Same relative strategic position as the present producing fold north of the Tuxpam River.

(*e*) Possibilities of additional oil-bearing formations, above the Tamasopo. Both the San Felipe and overlying shales contain frequent beds of sand in this region south of the Tuxpam River. As stated previously, the Furbero district produced from a sand in the Mendez shales, while the recent well drilled by the Penn-Mex Fuel Company at Zapotal encountered at least one good pay sand before reaching the Tamasopo lime.

GENERAL SUMMARY

In conclusion it seems to the authors that the present fields will continue to produce oil in large quantities during the time required to carry on prospecting for additional pools. Certain of the areas now being explored or already in the hands of strong companies offer excellent possibilities for the development of new and important production.

However, the opening up of these new fields will require new roads, railways, and later, pipe lines. These will, in general, be longer and more expensive than the present system of transportation, which has been built up for the present producing areas; and probably some of these new facilities will have to be operated as units separate from those already installed. The present transportation system must in large part be amortized out of the present producing fields. Costs of producing and operating will be higher per barrel than in the past, as wells will be, in general, smaller, and the fields will be more distant from each other. It is probable that the oil in the new pools will be of a higher grade, but even this cannot compensate for the higher costs of production.

These conditions will probably force upon the operators the necessity of cooperative or common-carrier pipe lines, railroads, telegraph lines, etc. The smaller companies will not usually be able to afford and maintain independent lines and equipment. In other words, producing conditions will more nearly parallel those prevailing in the United States than has heretofore been the case.

CHAPTER XXI

METHOD FOR PREDICTING FUTURE PRICES OF PETROLEUM

By

Paul Ruedemann[1]

Purpose of Predictions. — There are many reasons for desiring an estimate of the future price of oil. It is of value in deciding on the sale or retention of an oil property, on the advisability of a prospective large investment in lands or wells, and in making a decision as to whether immediate development or delayed investment would finally yield the greater returns. On the other hand, there are situations where the probable future price of oil has a slight influence on the program of the operator, as where competition is forcing immediate development, or where lease contracts stipulate that wells shall be drilled within a certain time. In cases where an oil field is under competitive development, the price a few months hence is of most concern. Where a field is substantially monopolized, the entire future course of prices requires full consideration.

The price of oil is a greater factor in areas of small production than in those of large production, as a drop of a few cents per barrel may mean inability to operate at a profit and hence the abandonment of the leases. On the other hand, the high prices paid for oil in 1920 resulted in the revival of some wells or pools which had been abandoned years before because they had been considered too small to be worth operating at the low price of that time. Many producers who purchased high-priced acreage in northern Oklahoma a few years ago were saved from a loss, not by the large production they had depended upon, for it did not materialize, but by the unprecedented increase in price. This was an instance of good fortune and not of foresight, as these operators had not anticipated such an advance.

Qualifications for the Work of Prediction. — The prediction of future prices requires an uncommon combination of statistical, geological, engineering and business ability. Such a combination is so

[1] Petroleum Engineer, Johnson, Huntley and Somers.

uncommon that the work must ordinarily be done by collaboration. The man trained as an engineer may be qualified to assemble the data and to draw certain conclusions, but he will need other valuable information which is to be gained only by consultation with those in other technical branches and on the executive staff. The fact that men too often rely on ill-supported guesses alone is reflected in many bankruptcies and ill-advised purchases and sales. Those purchasing production in the winter of 1920 and the spring of 1921, on a barrel-day price commensurate with the posted price, did so because, with the sun shining, the clouds on the horizon were overlooked.

No matter how complete the information, an unquestionable future price cannot, of course, be fixed. A probable error in the estimates will undoubtedly exist, but it can be kept low enough to make a careful study of the course of past and future prices the duty of someone on the staff of every large oil company.

Factors Affecting the Future Price. — The factors affecting the future price of oil may be divided into two groups, those studied historically, and those ascertained by a study of the present basis of the most important elements that will affect the future. In practice, the interrelation is often such that classification is difficult. The historical data to be used are:

1. Posted prices to date in the field under examination, and also posted prices in other fields which have an influence. These are more usable when plotted on a chart in conjunction with other information shown by curves on the same ordinates, or even as written entries at the indicated dates.

2. The annual production of petroleum by fields, (*a*) for the United States, (*b*) for countries competing in our markets, and (*c*) for the world.

3. The annual exports and imports of the United States.

4. The stocks of oil in storage at the end of each year.

5. The annual amount of gasoline produced in refineries.

6. The annual amount of natural-gas gasoline produced.

7. The price of gasoline by years.

8. The amount and price of the other principal refined products. The prices of various products are not always proportionate. In 1921 the gasoline price was kept up proportionately higher than the market price for the other products. This threw a disproportionate burden of the operating costs on the gasoline sales, as these fell off less than other sales. The changes in the price of the refined

products often antedate the price changes of petroleum. But the exact time of the changes in crude oil are often the result of field news concerning the large pools.

9. The number of pleasure cars registered each year, with an analysis to determine the probable " point of saturation " for this type of car.

10. The number of tractors in use each year.

11. The change in the number of gallons of gasoline consumed per car and per tractor.

12. The growth of the population of the United States. Future onsumption will depend largely on future population.

13. The annual price and production of other important commodities, such as steel and wheat, or better index numbers based on many commodities, such as Bradstreet's, Dun's and the Bureau of Labor's. These are to be used for the study of the changing value of money.

14. The change in Federal Reserve Bank Deposit indices.

15. An exhaustive study of some other exhaustible resource that has passed through a condition or series of conditions similar to those that may be anticipated in the oil industry.

16. Opinions of leading economists on the financial conditions. Much of this data has been compiled in convenient form in Pogue's " Economics of Petroleum."

The non-historical data to be considered are:

1. The oil reserves in this country available for the increasing number of wells that must be drilled.

2. Probable future of fields in competing countries.

3. Probability of governmental regulation, or even ownership, in the United States and in other countries.

4. The amount of progress being made in the technology of shale-oil production.

5. Status of competing motor fuels, present and potential.

6. Possible changes in the type and power of gasoline engines.

7. Possible adoption of other than gasoline-burning motors.

8. Increased efficiency in refining processes, possibly resulting in greater yield of gasoline, or other more valuable products, per barrel of crude oil.

9. Public sentiment toward conservation and the possible prohibition of fuel oil as a coal substitute.

10. Change in automobile demand, due to a future increase of replacements in proportion to new owners. Fig. 26.

Use to be Made of the Factors. — The oil prices to date are, of course, the basis from which the study starts. For each fluctuation, the analyst should determine the contributing cause or causes, if possible. Those conditions that are likely to reappear in the oil industry should be given special attention, while those least likely to

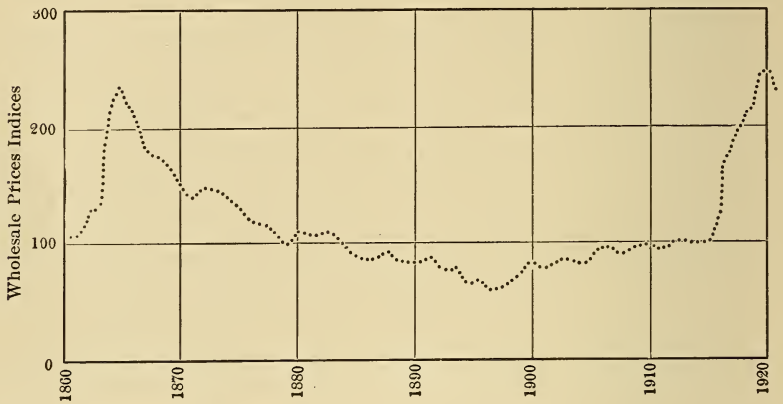


Fig. 26. Bureau of Labor wholesale price indices showing effect of Civil War and World War on prices.

influence price should be ignored. Of the latter, the depressions caused by the over-production at Glenn and Cushing are striking examples. The present demand, pipe-line and storage facilities, and the better knowledge of the oil market have altered the situation so that one such pool alone could never again have so depressing an effect on prices.

The consideration of the annual production by fields for the United States, and by countries for those competing in our markets, serves various purposes. When compared with prices for the same period, it shows to what extent price changes are correlated with production changes. A correct allowance can then be made for the effect on the market of the production curve of new fields.

The gasoline of all kinds produced each year, the amount sold per barrel of crude oil produced, and further, the gallons of gasoline and barrels of crude oil per motor vehicle, are essential figures. The country's 1920 production of petroleum amounted to less than 40 barrels to a motor vehicle. The increase in the number of consumers of gasoline has been greater than the increase in production, and consequently a gradual decrease in the amount available to each

consumer is to be noted. Since there is a limit to the amount of gasoline that can be extracted from a barrel of oil, the result to be expected is an increase in the efficiency of refinery methods and a decrease in motor requirements by the use of lower-grade fuels and substitutes, and a change in power and in types of motors. The average town car has much more power than is ever needed for town or city driving. There is also a large waste in consumption in the motors of cars designed for a speed of 55 to 100 miles an hour; perhaps at no time in the life of the car will it be called upon to attain anything like its maximum speed. The growth in the use of gasoline substitutes, even those that might be feasibly produced at this time at present prices, would necessarily be slow. The capital outlay required for the production of these substitutes is large, and consequently will not be made until successful ventures have removed the risk otherwise incurred.

So far, a close correlation between the price movement of other commodities and that of crude oil can be noticed. With the change in the ratio of the amount produced to the amount consumed by this country, a greater departure from general price movements will be evident. The various index numbers from reliable sources should be followed. Commodity price movements of all kinds are best reflected in these indices.

It has recently been shown that the price of commodities bears a relation to bank deposits. The Federal Reserve System, having in control about a third of the banks of the country, supplies a suitable source for these data.[1]

The opinions of the most reliable economists and students of finance should not be overlooked. The conclusions of trade journals, however, should be more critically read.

The shale-oil industry is not likely to produce oil in sufficient quantities to menace the price movement in the near future. In the first place, the initial investment required is enormous, and can therefore only be supplied slowly and in proportion as the price to be obtained stimulates the prospects. Furthermore, there will be no great supply of capital until such plants have proved themselves stable money-makers. The long period of necessary experimentation makes that date several years distant in the United States.

Regional Influences. — The factors affecting price changes vary geographically: the producer in Mexico is particularly affected by the

[1] Working, Holbrook: The Annalist (June 27, 1921) Vol. 17, No. 441, pp. 686.

political situation; the Appalachian producer is most affected by the gasoline market; the Californian producer is chiefly concerned with the fuel oil prices, which depend greatly on the price paid in that state for coal, with which his fuel oil competes. At one time, prices in the Appalachian field had considerable influence on the price of all other grades of oil in the country, except the Californian oil. This price dominance of Appalachian grades, however, has dwindled, and now the price in the Mid-Continent field is the most important.

Normal Price and War Inflation. — The Bureau of Labor and other price indices show that the winter of 1915 was the starting-point for the increase in price arising from war conditions. Due to the 1914–1915 oil depression, the price of crude oil in relation to 1913 is 80, although the average of the Bureau of Labor's selected list of wholesale commodities is at 100 in November, 1915, as compared with 1913. Thereafter, the increase in both was the same, and it was not until the 1919–1920 increases that the price of crude oil recovered from its 20-point lag.

The drop of Pennsylvania crude to $2.25 in 1921 is relatively on a par with the lowest 1915 price, $1.35. The prices of other commodities have not been deflated (January 1922) as much as have prices of crude oil. Labor and material costs are at about 150 as compared with 100 in 1913.

A diagram, Fig. 27, shows that after the elimination of money inflation, the price was never over $2.50 for Pennsylvania grade except for about six months. The oil man sold his product, in relation to the 1913 price, 40 per cent below the average of other commodities during most of 1914–1915; thereafter the price of oil lagged 20 per cent behind, until May, 1920, when the price of oil recovered to the level of other products, only to drop below again in a few months. Operating and development costs are still on an inflated basis and are likely to maintain their present level, while the price of oil is deflated nearly to pre-war level. The indices are an aid in determining whether any increase or decrease is contrary to the general market conditions.

Historical Influence on Increases in Price. — Perhaps no better method of observing the effect of over-production and other factors on price can be found than to plot the posted prices on quadrillé paper and to mark the probable cause for each condition. As an illustration, a graph of Appalachian posted prices has been made, (Fig. 28). On this graph, one should note the following points:

1. After the peak of Appalachian production had been passed, a rapid general increase in price followed, but it was kept from too extreme a swing by the discovery of new oil-bearing regions.

2. Price changes take effect after a production change has been in progress some time.

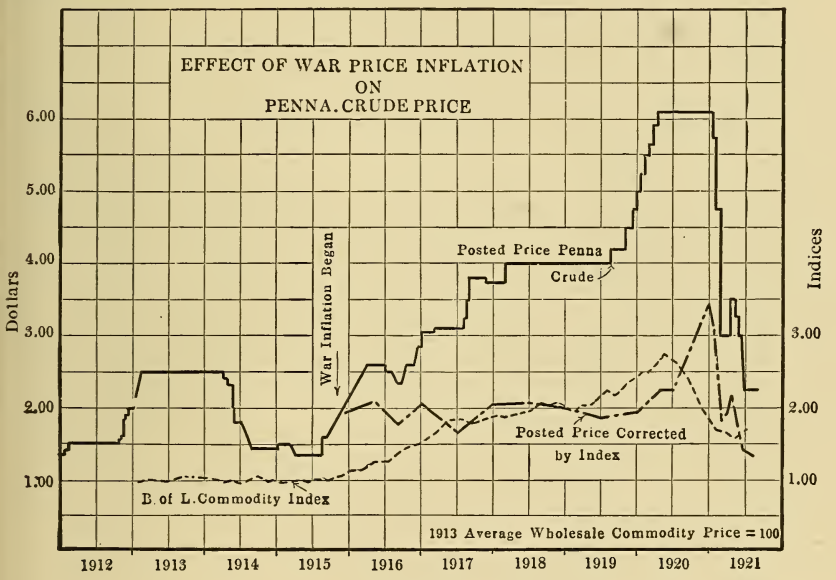


FIG. 27.

3. The effect on price of single new pools is not so depressing nor so persistent as it formerly was. The Eldorado pool in Kansas and the Eldorado pool in Arkansas may be taken as illustrations.

4. The price of oil was deflated more than that of any other of the principal commodities, after the Great War inflation.

5. The troughs and crests of minor oscillations have been spaced at about six-year intervals, but there is no reason to postulate a continuance of this particular interval. The graph is not complete, for oil in storage and in producers' tanks, production, exports and many other factors must be studied in connection with each large fluctuation in price. After one has found the line of normal increase for any particular field, the next step is to determine how great any deviation therefrom in the future is likely to be.

Predictions for Long and Short Periods. — If the aim is to postulate the price for the immediate future, minor oscillations from the

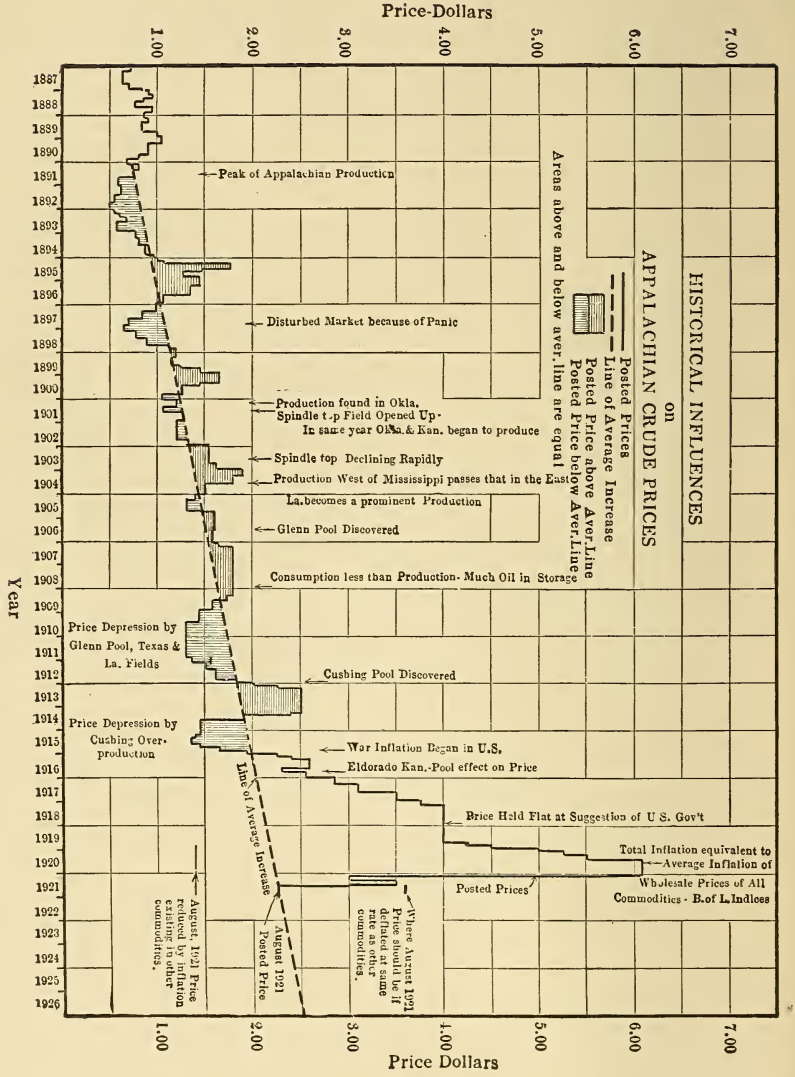

Price-Dollars
1.00
2.00
3.00
4.00
5.00
6.00
7.00
Year
1887
1888
1889
1890
1891
1892
1893
1894
1895
1896
1897
1898
1899
1900
1901
1902
1903
1904
1905
1906
1907
1908
1909
1910
1911
1912
1913
1914
1915
1916
1917
1918
1919
1920
1921
1922
1923
1924
1925
1926
HISTORICAL INFLUENCES on APPALACHIAN CRUDE PRICES
Posted Prices
Line of Average Increase
Posted Price above Aver. Line
Posted Price below Aver. Line
Areas above and below aver. line are equal
Peak of Appalachian Production
Disturbed Market because of Panic
Production found in Okla.
Spindle top Field Opened Up-
In same year Okla. & Kan. began to produce
Spindle top Declining Rapidly
Production West of Mississippi passes that in the East
La. becomes a prominent Production
Glenn Pool Discovered
Consumption less than Production- Much Oil in Storage
Price Depression by Glenn Pool, Texas & La. Fields
Cushing Pool Discovered
Price Depression by Cushing Over-production
War Inflation Began in U.S.
Eldorado Kan.-Pool effect on Price
Price Held Flat at Suggestion of U.S. Gov't
Total Inflation equivalent to
Average Inflation of
Wholesale Prices of All Commodities - B. of L. Indices
Posted Prices
Line of Average Increase
August 1921 Price reduced by inflation existing in other commodities.
August 1921 Posted Price
Where August 1921 Price should be if deflated at same rate as other commodities.
Price Dollars

FIG. 28.

average line and present market conditions should be the controlling factors. The price may be above or below the average line at the start, and consequently may affect the production to be appraised in the early years. For the purpose of ascertaining the rate of change for long periods of years, an average line, based on history to date, and modified by probable influencing factors, is advisable.

The Average Line of Increase. — The average line of increase is not always a straight line. From the time of the peak of production until that of the development of new fields, the Appalachian price indicated the probability of an exponential rate of increase. Where such cases are evident, arithlog paper offers a more satisfactory means of making an average line. It is generally best to use quadrillé paper first, to determine the exact position of the line, and then to transfer the information to the arithlog paper, if necessary. That an exponential rate of increase will occur in the future, until shale oil becomes an important factor, is not at all improbable in view of the present supply and market.

CHAPTER XXII

THE OUTLOOK IN THE OIL INDUSTRY

The situation of the oil industry in the United States, in the summer of 1921, was one of over-production. Although the demand for refined products was slightly greater than in 1920, the increase in demand was not proportionate to the increase in production; yet neither the production nor the consumption in 1921 was what might have been expected at the normal rate of increase.

emand. — The real situation seems to have been a slackening of the normal increase in consumption, due to

1. The general industrial depression both in the United States and abroad, and

2. A decline in the former rate of increase in the use of automobiles and trucks.

The demand of the immediately preceding years for automobiles was abnormally large, since, during the war, practically the entire supply had necessarily been diverted to war needs rather than to general business or pleasure purposes. These latter needs accordingly accumulated, till in 1919 and 1920 the demand was fairly well filled by the various automobile factories. That abnormal rate of increase could not reasonably be expected to be maintained, even if the country had not suffered a financial depression in 1921.

Supply. — At the same time, there was a domestic over-supply of petroleum and its products, brought about by several factors:

1. Improvements in methods of refining yielded a larger gasoline fraction.

2. An excess of oil had been put in storage, as the demand had not equaled what the producers anticipated.

3. Exports of oil had decreased, largely on account of the unfavorable exchange situation.

4. Very large quantities of crude oil were imported from Mexico.

Price. — The price for crude oil in the summer of 1921 had fallen below the index for general commodity prices. As money rates, labor, and prices for materials still showed considerable war inflation,

this discrepancy acted as a positive discrimination against the oil-producer. In Oklahoma, for instance, he was actually receiving less value for his oil at $1 per barrel, in 1921, than he was when he sold it at 35 cents during most of the period of over-production in 1915, when the Cushing pool came in.

The recovery of the oil market came (October 1, 1921) when the Eldorado pool, Arkansas, first showed a marked decline in production. The large size of the wells and the indefiniteness of the area of the pool had indicated a probability of increasing over-production, until the developments of September showed that henceforth no increase could be expected from this pool. The production at Mexia, Texas, coming on so much more rapidly (December, 1921) than had been expected, led to the reaction of January 1922.

Looking beyond the general period of 1921–1922, a much higher price for oil is indicated. The main factors working to this end are the following:

1. Industrial consumption, both in the United States and in Europe, is increasing.

2. There will be a decline in present production. Approximately 35 per cent of the present domestic production is less than one year old, and an additional 15 per cent is less than two years old. This will rapidly decline, and more new drilling will be necessary to maintain the production than is likely to be undertaken with constantly increasing hazards and depth.

3. The present over-production is the result of five years of active wildcatting. When the present newer pools have declined, it will probably take a longer time to develop an equal amount of new production, as at the present time wildcatting is less active, and so many of the prospects that had been eagerly looked forward to have been dry holes. Sands offering poorer and poorer chances are being drilled (Fig. 29). Large areas are being eliminated as possible oil-producing fields.

4. Domestic oil-producers will profit by the increased cost of foreign production. The extraordinary producing conditions in Mexico, resulting from the phenomenal yields per well and the possibility of draining large areas with one well, are not likely to be duplicated after the present Dos Bocas-Alamo field is exhausted in the near future; and, after 1922, foreign producers with higher costs will require a higher price, just as in the case of domestic operators.

5. In 1923, Mexican exports will probably total much less than

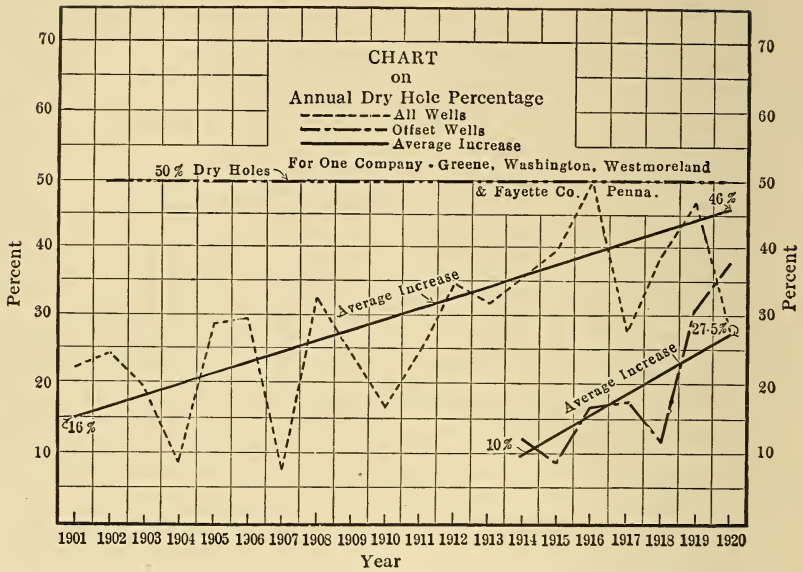


CHART
on
Annual Dry Hole Percentage
All Wells
Offset Wells
Average Increase
For One Company - Greene, Washington, Westmoreland
& Fayette Co., Penna.
50% Dry Holes
Average Increase
Average Increase
16%
10%
46%
27.5%
Percent
Percent
70
60
50
40
30
20
10
1901 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920
Year

FIG. 29.

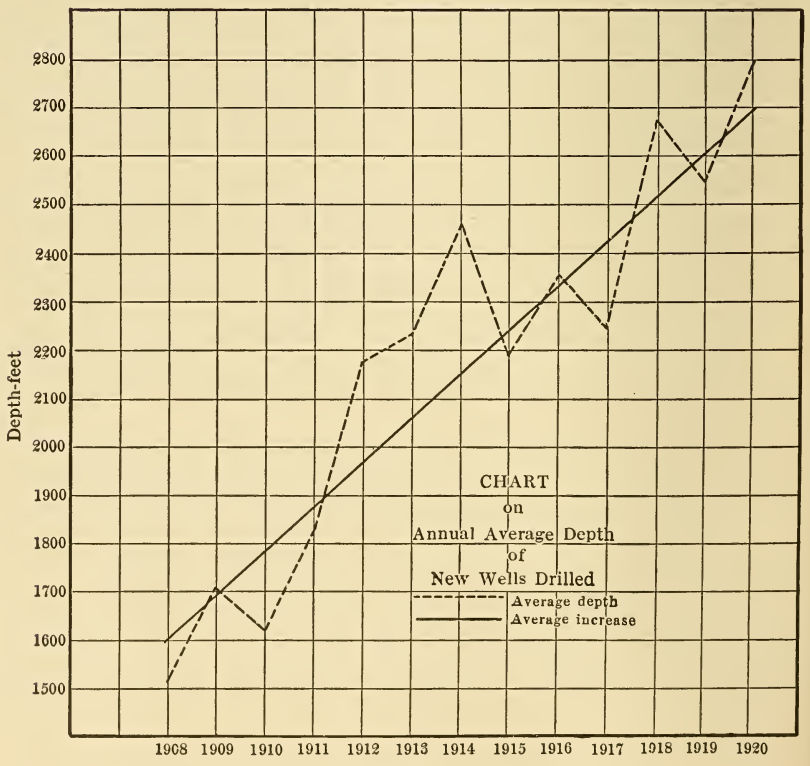


CHART
on
Annual Average Depth
of
New Wells Drilled
Average depth
Average increase
Depth-feet
2800
2700
2600
2500
2400
2300
2200
2100
2000
1900
1800
1700
1600
1500
1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920

FIG. 30.

the daily average for 1920. This oil will be produced under such conditions and taxes that it will scarcely compete with production in the United States.

6. The oil market will be stabilized. As the market for oil products becomes greater, and oil is utilized more universally for many needs, and as the producing districts are more widely distributed throughout the world, with an ever-widening net of pipe lines, it will become increasingly difficult to break the oil market by bringing in new pools.

7. The necessity of drilling greater depths to reach producing sands will necessitate an increase in the market price for oil (Fig. 30).

8. The production of gasoline substitutes, such as shale oil, oil from coal, alcohol, etc., requires an enormous investment of capital, following a great deal of expensive preliminary experiment. Capitalists will be reluctant to go into such ventures until they are convinced that the oil market is past the danger of demoralization by the occasional discovery of large pools of oil, as during 1921 and before. These considerations make it unlikely that the market for petroleum products will be seriously affected, for several years, by competition from this source.

APPENDIX

OIL LAND ACT OF FEBRUARY 25, 1920

[PUBLIC—NO. 146—66TH CONGRESS.]

[S. 2775.]

AN ACT To promote the mining of coal, phosphate, oil, oil shale, gas, and sodium on the public domain.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That deposits of coal, phosphate, sodium, oil, oil shale, or gas, and lands containing such deposits owned by the United States, including those in national forests, but excluding lands acquired under the act known as the Appalachian Forest act, approved March 1, 1911 (Thirty-sixth Statutes, page 961), and those in national parks, and in lands withdrawn or reserved for military or naval uses or purposes, except as hereinafter provided, shall be subject to disposition in the form and manner provided by this act to citizens of the United States, or to any association of such persons, or to any corporation organized under the laws of the United States, or of any State or Territory thereof, and in the case of coal, oil, oil shale, or gas, to municipalities: *Provided*, That the United States reserves the right to extract helium from all gas produced from lands permitted, leased, or otherwise granted under the provisions of this act, under such rules and regulations as shall be prescribed by the Secretary of the Interior: *Provided further*, That in the extraction of helium from gas produced from such lands, it shall be so extracted as to cause no substantial delay in the delivery of gas produced from the well to the purchaser thereof: *And provided further*, That citizens of another country, the laws, customs, or regulations of which deny similar or like privileges to citizens or corporations of this country, shall not by stock ownership, stock holding, or stock control own any interest in any lease acquired under the provisions of this act.

[Sections 2 to 8, inclusive, relate to coal.]

[Sections 9 to 12, inclusive, relate to phosphates.]

OIL AND GAS

SEC. 13. That the Secretary of the Interior is hereby authorized, under such necessary and proper rules and regulations as he may prescribe, to grant to any applicant qualified under this Act a prospecting permit, which shall give the exclusive right, for a period not exceeding two years, to prospect for oil or gas upon not to exceed two thousand five hundred and sixty acres of land wherein such deposits belong to the United States and are not within any known geological structure of a producing oil or gas field upon condition that the permittee shall begin drilling operations within six months from the date of the permit, and shall, within one year

from and after the date of permit, drill one or more wells for oil or gas to a depth of not less than five hundred feet each, unless valuable deposits of oil or gas shall be sooner discovered, and shall, within two years from date of the permit, drill for oil or gas to an aggregate depth of not less than two thousand feet unless valuable deposits of oil or gas shall be sooner discovered. The Secretary of the Interior may, if he shall find that the permittee has been unable with the exercise of diligence to test the land in the time granted by the permit, extend any such permit for such time, not exceeding two years, and upon such conditions as he shall prescribe. Whether the lands sought in any such application and permit are surveyed or unsurveyed the applicant shall, prior to filing his application for permit, locate such lands in a reasonably compact form and according to the legal subdivisions of the public land surveys if the land be surveyed; and in an approximately square or rectangular tract if the land be an unsurveyed tract, the length of which shall not exceed two and one-half times its width, and if he shall cause to be erected upon the land for which a permit is sought a monument not less than four feet high, at some conspicuous place thereon, and shall post a notice in writing on or near said monument, stating that an application for permit will be made within thirty days after date of posting said notice, the name of the applicant, the date of the notice, and such a general description of the land to be covered by such permit by reference to courses and distances from such monument and such other natural objects and permanent monuments as will reasonably identify the land, stating the amount thereof in acres, he shall during the period of thirty days following such marking and posting, be entitled to a preference right over others to a permit for the land so identified. The applicant shall, within ninety days after receiving a permit, mark each of the corners of the tract described in the permit upon the ground with substantial monuments, so that the boundaries can be readily traced on the ground, and shall post in a conspicuous place upon the lands a notice that such permit has been granted and a description of the lands covered thereby: *Provided*, That in the Territory of Alaska prospecting permits not more than five in number may be granted to any qualified applicant for periods not exceeding four years, actual drilling operations shall begin within two years from date of permit, and oil and gas wells shall be drilled to a depth of not less than five hundred feet, unless valuable deposits of oil or gas shall be sooner discovered, within three years from date of the permit and to an aggregate depth of not less than two thousand feet unless valuable deposits of oil or gas shall be sooner discovered, within four years from date of permit: *Provided further*, That in said Territory the applicant shall have a preference right over others to a permit for land identified by temporary monuments and notice posted on or near the same for six months following such marking and posting, and upon receiving a permit he shall mark the corners of the tract described in the permit upon the ground with substantial monuments within one year after receiving such permit.

Sec. 14. That upon establishing to the satisfaction of the Secretary of the Interior that valuable deposits of oil or gas have been discovered within the limits of the land embraced in any permit, the permittee shall be entitled to a lease for one-fourth of the land embraced in the prospecting permit: *Provided*, That the permittee shall be granted a lease for as much as one hundred and sixty acres of said lands, if there be that number of acres within the permit. The area to be selected by the permittee shall be in compact form and, if surveyed, to be described by the legal subdivisions of the public-land surveys; if unsurveyed, to be surveyed

by the Government at the expense of the applicant for lease in accordance with rules and regulations to be prescribed by the Secretary of the Interior, and the lands leased shall be conformed to and taken in accordance with the legal subdivisions of such surveys; deposits made to cover expense of surveys shall be deemed appropriated for that purpose, and any excess deposits may be repaid to the person or persons making such deposit or their legal representatives. Such leases shall be for a term of twenty years upon a royalty of 5 per centum in amount or value of the production and the annual payment in advance of a rental of $1 per acre, the rental paid for any one year to be credited against the royalties as they accrue for that year, with the right of renewal as prescribed in section 17 hereof. The permittee shall also be entitled to a preference right to a lease for the remainder of the land in his prospecting permit at a royalty of not less than 12½ per centum in amount or value of the production, and under such other conditions as are fixed for oil or gas leases in this act, the royalty to be determined by competitive bidding or fixed by such other method as the Secretary may by regulations prescribe: *Provided*, That the Secretary shall have the right to reject any or all bids.

Sec. 15. That until the permittee shall apply for lease to the one quarter of the permit area heretofore provided for he shall pay to the United States 20 per centum of the gross value of all oil or gas secured by him from the lands embraced within his permit and sold or otherwise disposed of or held by him for sale or other disposition.

Sec. 16. That all permits and leases of lands containing oil or gas, made or issued under the provisions of this act, shall be subject to the condition that no wells shall be drilled within two hundred feet of any of the outer boundaries of the lands so permitted or leased, unless the adjoining lands have been patented or the title thereto otherwise vested in private owners, and to the further condition that the permittee or lessee will, in conducting his explorations and mining operations, use all reasonable precautions to prevent waste of oil or gas developed in the land, or the entrance of water through wells drilled by him to the oil sands or oil-bearing strata, to the destruction or injury of the oil deposits. Violations of the provisions of this section shall constitute grounds for the forfeiture of the permit or lease, to be enforced through appropriate proceedings in courts of competent jurisdiction.

Sec. 17. That all unappropriated deposits of oil or gas situated within the known geologic structure of a producing oil or gas field and the unentered lands containing the same, not subject to preferential lease, may be leased by the Secretary of the Interior to the highest responsible bidder by competitive bidding under general regulations to qualified applicants in areas not exceeding six hundred and forty acres and in tracts which shall not exceed in length two and one-half times their width, such leases to be conditioned upon the payment by the lessee of such bonus as may be accepted and of such royalty as may be fixed in the lease, which shall not be less than 12½ per centum in amount or value of the production, and the payment in advance of a rental of not less than $1 per acre per annum thereafter during the continuance of the lease, the rental paid for any one year to be credited against the royalties as they accrue for that year. Leases shall be for a period of twenty years, with the preferential right in the lessee to renew the same for successive periods of ten years upon such reasonable terms and conditions as may be prescribed by the Secretary of the Interior, unless otherwise provided by law at the time of the expiration of such periods. Whenever the average daily production of any oil

well shall not exceed ten barrels per day, the Secretary of the Interior is authorized to reduce the royalty on future production when in his judgment the wells can not be successfully operated upon the royalty fixed in the lease. The provisions of this paragraph shall apply to all oil and gas leases made under this act.

SEC. 18. That upon relinquishment to the United States, filed in the General Land Office within six months after the approval of this act, of all right, title, and interest claimed and possessed prior to July 3, 1910, and continuously since by the claimant or his predecessor in interest under the preexisting placer mining law to any oil or gas bearing land upon which there has been drilled one or more oil or gas wells to discovery embraced in the Executive order of withdrawal issued September 27, 1909, and not within any naval petroleum reserve, and upon payment as royalty to the United States of an amount equal to the value at the time of production of one-eighth of all the oil or gas already produced except oil or gas used for production purposes on the claim, or unavoidably lost, from such land, the claimant, or his successor, if in possession of such land, undisputed by any other claimant prior to July 1, 1919, shall be entitled to a lease thereon from the United States for a period of twenty years, at a royalty of not less than 12½ per centum of all the oil or gas produced except oil or gas used for production purposes on the claim, or unavoidably lost: *Provided*, That not more than one-half of the area, but in no case to exceed three thousand two hundred acres, within the geologic oil or gas structure of a producing oil or gas field shall be leased to any one claimant under the provision of this section when the area of such geologic oil structure exceeds six hundred and forty acres. Any claimant or his successor, subject to this limitation, shall, however, have the right to select and receive the lease as in this section provided for that portion of his claim or claims equal to, but not in excess of, said one-half of the area of such geologic oil structure, but not more than three thousand two hundred acres.

All such leases shall be made and the amount of royalty to be paid for oil and gas produced, except oil or gas used for production purposes on the claim, or unavoidably lost, after the execution of such lease shall be fixed by the Secretary of the Interior under appropriate rules and regulations: *Provided, however*, That as to all like claims situate within any naval petroleum reserve the producing wells thereon only shall be leased, together with an area of land sufficient for the operation thereof, upon the terms and payment of royalties for past and future production as herein provided for in the leasing of claims. No wells shall be drilled in the land subject to this provision within six hundred and sixty feet of any such leased well without the consent of the lessee: *Provided, however*, That the President may, in his discretion, lease the remainder or any part of any such claim upon which such wells have been drilled, and in the event of such leasing said claimant or his successor shall have a preference right to such lease: *And provided further*, That he may permit the drilling of additional wells by the claimant or his successor within the limited area of six hundred and sixty feet theretofore provided for upon such terms and conditions as he may prescribe.

No claimant for a lease who has been guilty of any fraud or who had knowledge or reasonable grounds to know of any fraud, or who has not acted honestly and in good faith, shall be entitled to any of the benefits of this section.

Upon the delivery and acceptance of the lease, as in this section provided, all suits brought by the Government affecting such lands may be settled and adjusted in accordance herewith and all moneys impounded in such suits or under the Act

entitled "An Act to amend an Act entitled 'An Act to protect the locators in good faith of oil and gas lands who shall have effected an actual discovery of oil or gas on the public lands of the United States, or their successors in interest,' approved March 2, 1911," approved August 25, 1914 (Thirty-eighth Statutes at Large, page 708), shall be paid over to the parties entitled thereto. In case of conflicting claimants for leases under this section, the Secretary of the Interior is authorized to grant leases to one or more of them as shall be deemed just. All leases hereunder shall inure to the benefit of the claimant and all persons claiming through or under him by lease, contract, or otherwise, as their interests may appear, subject, however, to the same limitation as to area and acreage as is provided for claimant in this section: *Provided*, That no claimant acquiring and interest in such lands since September 1, 1919, from a claimant on or since said date claiming or holding more than the maximum allowed claimant under this section shall secure a lease thereon or any interest therein, but the inhibition of this proviso shall not apply to an exchange of any interest in such lands made prior to the 1st day of January, 1920, which did not increase or reduce the area or acreage held or claimed in excess of said maximum by either party to the exchange: *Provided further*, That no lease or leases under this section shall be granted, nor shall any interest therein inure, to any person, association, or corporation for a greater aggregate area or acreage than the maximum in this section provided for.

SEC. 18a. That whenever the validity of any gas or petroleum placer claim under preexisting law to land embraced in the Executive order of withdrawal issued September 27, 1909, has been or may hereafter be drawn in question on behalf of the United States in any departmental or judicial proceedings, the President is hereby authorized at any time within twelve months after the approval of this Act to direct the compromise and settlement of any such controversy upon such terms and conditions as may be agreed upon, to be carried out by an exchange or division of land or division of the proceeds of operation.

SEC. 19. That any person who on October 1, 1919, was a bona fide occupant or claimant of oil or gas lands under a claim initiated while such lands were not withdrawn from oil or gas location and entry, and who had previously performed all acts under then existing laws necessary to valid locations thereof except to make discovery and upon which discovery had not been made prior to the passage of this act, and who has performed work or expended on or for the benefit of such locations an amount equal in the aggregate of $250 for each location if application therefor shall be made within six months from the passage of this act shall be entitled to prospecting permits thereon upon the same terms and conditions, and limitations as to acreage, as other permits provided for in this act, or where any such person has heretofore made such discovery, he shall be entitled to a lease thereon under such terms as the Secretary of the Interior may prescribe unless otherwise provided for in section 18 hereof: *Provided*, That where such prospecting permit is granted upon lands within any known geologic structure of a producing oil or gas field, the royalty to be fixed in any lease thereafter granted thereon or any portion thereof shall be not less than 12½ per centum of all the oil or gas produced except oil or gas used for production purposes on the claim, or unavoidably lost: *Provided, however*, That the provisions of this section shall not apply to lands reserved for the use of the Navy: *Provided, however*, That no claimant for a permit or lease who has been guilty of any fraud or who had knowledge or reasonable grounds to know of any

fraud, or who has not acted honestly and in good faith, shall be entitled to any of the benefits of this section.

All permits or leases hereunder shall inure to the benefit of the claimant and all persons claiming through or under him by lease, contract, or otherwise, as their interests may appear.

SEC. 20. In the case of lands bona fide entered as agricultural and not withdrawn or classified as mineral at the time of entry, but not including lands claimed under any railroad grant, the entryman or patentee, or assigns, where assignment was made prior to January 1, 1918, if the entry has been patented with the mineral right reserved, shall be entitled to a preference right to a permit and to a lease, as herein provided, in case of discovery; and within an area not greater than a township such entryman and patentees or assigns holding restricted patents may combine their holdings, not to exceed two thousand five hundred and sixty acres, for the purpose of making joint application. Leases executed under this section and embracing only lands so entered shall provide for the payment of a royalty of not less than 12½ per centum as to such areas within the permit as may not be included within the discovery lease to which the permittee is entitled under section 14 hereof.

[Section 21 relates to oil shale.]

ALASKA OIL PROVISO

SEC. 22. That any bona fide occupant or claimant of oil or gas bearing lands in the Territory of Alaska, who, or whose predecessors in interest, prior to withdrawal had complied otherwise with the requirements of the mining laws, but had made no discovery of oil or gas in wells and who prior to withdrawal had made substantial improvements for the discovery of oil or gas on or for each location or had prior to the passage of this act expended not less than $250 in improvements on or for each location shall be entitled, upon relinquishment or surrender to the United States within one year from the date of this act, or within six months after final denial or withdrawal of application for patent, to a prospecting permit or permits, lease or leases, under this act covering such lands, not exceeding five permits or leases in number and not exceeding an aggregate of one thousand two hundred and eighty acres in each: *Provided*, That leases in Alaska under this act whether as a result of prospecting permits or otherwise shall be upon such rental and royalties as shall be fixed by the Secretary of the Interior and specified in the lease, and be subject to readjustment at the end of each twenty-year period of the lease: *Provided further*, That for the purpose of encouraging the production of petroleum products in Alaska the Secretary may, in his discretion, waive the payment of any rental or royalty not exceeding the first five years of any lease.

No claimant for a lease who has been guilty of any fraud or who had knowledge or reasonable grounds to know of any fraud, or who has not acted honestly and in good faith, shall be entitled to any of the benefits of this section.

[Sections 23, 24, and 25 relate to sodium.]

GENERAL PROVISIONS APPLICABLE TO COAL, PHOSPHATE, SODIUM, OIL, OIL SHALE, AND GAS LEASES

SEC. 26. That the Secretary of the Interior shall reserve and may exercise the authority to cancel any prospecting permit upon failure by the permittee to exercise due diligence in the prosecution of the prospecting work in accordance with

the terms and conditions stated in the permit, and shall insert in every such permit issued under the provisions of this act appropriate provision for its cancellation by him.

SEC. 27. That no person, association, or corporation, except as herein provided, shall take or hold more than one coal, phosphate, or sodium lease during the life of such lease in any one State; no person, association, or corporation shall take or hold, at one time, more than three oil or gas leases granted hereunder in any one State, and not more than one lease within the geologic structure of the same producing oil or gas field; no corporation shall hold any interest as a stockholder of another corporation in more than such number of leases; and no person or corporation shall take or hold any interest or interests as a member of an association or associations or as a stockholder of a corporation or corporations holding a lease under the provisions hereof, which, together with the area embraced in any direct holding of a lease under this act, or which, together with any other interest or interests as a member of an association or associations or as a stockholder of a corporation or corporations holding a lease under the provisions hereof, for any kind of mineral leased hereunder, exceeds in the aggregate an amount equivalent to the maximum number of acres of the respective kinds of minerals allowed to any one lessee under this act. Any interests held in violation of this act shall be forfeited to the United States by appropriate proceedings instituted by the Attorney General for that purpose in the United States district court for the district in which the property, or some part thereof, is located, except that any ownership or interest forbidden in this act which may be acquired by descent, will, judgment, or decree may be held for two years and not longer after its acquisition: *Provided*, That nothing herein contained shall be construed to limit sections 18, 18a, 19, and 22, or to prevent any number of lessees under the provisions of this act from combining their several interests so far as may be necessary for the purposes of constructing and carrying on the business of a refinery, or of establishing and constructing as a common carrier a pipe line or lines of railroads to be operated and used by them jointly in the transportation of oil from their several wells, or from the wells of other lessees under this act, or the transportation of coal: *Provided further*, That any combination for such purpose or purposes shall be subject to the approval of the Secretary of the Interior on application to him for permission to form the same: *And provided further*, That if any of the lands or deposits leased under the provisions of this act shall be subleased, trusteed, possessed, or controlled by any device permanently, temporarily, directly, indirectly, tacitly, or in any manner whatsoever, so that they form part of, or are in anywise controlled by any combination in the form of an unlawful trust, with consent of lessee, or form the subject of any contract or conspiracy in restraint of trade in the mining or selling of coal, phosphate, oil, oil shale, gas, or sodium entered into by the lessee, or any agreement or understanding, written, verbal, or otherwise to which such lessee shall be a party, of which his or its output is to be or become the subject, to control the price or prices thereof or of any holding of such lands by any individual, partnership, association, corporation, or control in excess of the amounts of lands provided in this act, the lease thereof shall be forfeited by appropriate court proceedings.

SEC. 28. That rights of way through the public lands, including the forest reserves, of the United States are hereby granted for pipe-line purposes for the transportation of oil or natural gas to any applicant possessing the qualifications pro-

vided in section 1 of this Act, to the extent of the ground occupied by the said pipe line and twenty-five feet on each side of the same under such regulations as to survey, location, application, and use as may be prescribed by the Secretary of the Interior and upon the express condition that such pipe lines shall be constructed, operated, and maintained as common carriers: *Provided*, That the Government shall in express terms reserve and shall provide in every lease of oil lands hereunder that the lessee, assignee, or beneficiary, if owner, or operator or owner of a controlling interest in any pipe line or of any company operating the same which may be operated accessible to the oil derived from lands under such lease, shall at reasonable rates and without discrimination accept and convey the oil of the Government or of any citizen or company not the owner of any pipe line, operating a lease or purchasing gas or oil under the provisions of this Act: *Provided further*, That no right of way shall hereafter be granted over said lands for the transportation of oil or natural gas except under and subject to the provisions, limitations, and conditions of this section. Failure to comply with the provisions of this section or the regulations prescribed by the Secretary of the Interior shall be ground for forfeiture of the grant by the United States district court for the district in which the property, or some part thereof, is located in an appropriate proceeding.

Sec. 29. That any permit, lease, occupation, or use permitted under this Act shall reserve to the Secretary of the Interior the right to permit upon such terms as he may determine to be just, for joint or several use, such easements or rights of way, including easements in tunnels upon, through, or in the lands leased, occupied, or used as may be necessary or appropriate to the working of the same, or of other lands containing the deposits described in this Act, and the treatment and shipment of the products thereof by or under authority of the Government, its lessees, or permittees, and for other public purposes: *Provided*, That said Secretary, in his discretion, in making any lease under this Act, may reserve to the United States the right to lease, sell, or otherwise dispose of the surface of the lands embraced within such lease under existing law or laws hereafter enacted, in so far as said surface is not necessary for use of the lessee in extracting and removing the deposits therein: *Provided further*, That if such reservation is made it shall be so determined before the offering of such lease: *And provided further*, That the said Secretary, during the life of the lease, is authorized to issue such permits for easements herein provided to be reserved.

Sec. 30. That no lease issued under the authority of this act shall be assigned or sublet, except with the consent of the Secretary of the Interior. The lessee may, in the discretion of the Secretary of the Interior, be permitted at any time to make written relinquishment of all rights under such a lease, and upon acceptance thereof be thereby relieved of all future obligations under said lease, and may with like consent surrender any legal subdivision of the area included within the lease. Each lease shall contain provisions for the purpose of insuring the exercise of reasonable diligence, skill, and care in the operation of said property; a provision that such rules for the safety and welfare of the miners and for the prevention of undue waste as may be prescribed by said Secretary shall be observed, including a restriction of the workday to not exceeding eight hours in any one day for underground workers except in cases of emergency; provisions prohibiting the employment of any boy under the age of sixteen or the employment of any girl or woman, without regard to age, in any mine below the surface; provisions securing the workmen complete

freedom of purchase; provision requiring the payment of wages at least twice a month in lawful money of the United States, and providing proper rules and regulations to insure the fair and just weighing or measurement of the coal mined by each miner, and such other provisions as he may deem necessary to insure the sale of the production of such leased lands to the United States and to the public at reasonable prices, for the protection of the interests of the United States, for the prevention of monopoly, and for the safeguarding of the public welfare: *Provided*, That none of such provisions shall be in conflict with the laws of the State in which the leased property is situated.

SEC. 31. That any lease issued under the provisions of this act may be forfeited and canceled by an appropriate proceeding in the United States district court for the district in which the property, or some part thereof, is located, whenever the lessee fails to comply with any of the provisions of this act, of the lease, or of the general regulations promulgated under this act and in force at the date of the lease; and the lease may provide for resort to appropriate methods for the settlement of disputes or for remedies for breach of specified conditions thereof.

SEC. 32. That the Secretary of the Interior is authorized to prescribe necessary and proper rules and regulations and to do any and all things necessary to carry out and accomplish the purposes of this act, also to fix and determine the boundary lines of any structure, or oil or gas field, for the purposes of this act: *Provided*, That nothing in this act shall be construed or held to affect the rights of the States or other local authority to exercise any rights which they may have, including the right to levy and collect taxes upon improvements, output of mines, or other rights, property, or assets of any lessee of the United States.

SEC. 33. That all statements, representations, or reports required by the Secretary of the Interior under this act shall be upon oath, unless otherwise specified by him, and in such form and upon such blanks as the Secretary of the Interior may require.

SEC. 34. That the provisions of this act shall also apply to all deposits of coal, phosphate, sodium, oil, oil shale, or gas in the lands of the United States, which lands may have been or may be disposed of under laws reserving to the United States such deposits, with the right to prospect for, mine, and remove the same, subject to such conditions as are or may hereafter be provided by such laws reserving such deposits.

SEC. 35. That 10 per centum of all money received from sales, bonuses, royalties, and rentals under the provisions of this act, excepting those from Alaska, shall be paid into the Treasury of the United States and credited to miscellaneous receipts; for past production 70 per centum, and for future production 52½ per centum of the amounts derived from such bonuses, royalties, and rentals shall be paid into, reserved, and appropriated as a part of the reclamation fund created by the act of Congress, known as the reclamation act, approved June 17, 1902, and for past production 20 per centum, and for future production 37½ per centum of the amounts derived from such bonuses, royalties, and rentals shall be paid by the Secretary of the Treasury after the expiration of each fiscal year to the State within the boundaries of which the leased lands or deposits are or were located, said moneys to be used by such State or subdivisions thereof for the construction and maintenance of public roads or for the support of public schools or other public educational institutions, as the legislature of the State may direct: *Provided*, That all moneys

which may accrue to the United States under the provisions of this act from lands within the naval petroleum reserves shall be deposited in the Treasury as "Miscellaneous receipts."

SEC. 36. That all royalty accruing to the United States under any oil or gas lease or permit under this act on demand of the Secretary of the Interior shall be paid in oil or gas.

Upon granting any oil or gas lease under this act, and from time to time thereafter during said lease, the Secretary of the Interior shall, except whenever in his judgment it is desirable to retain the same for the use of the United States, offer for sale for such period as he may determine, upon notice and advertisement on sealed bids or at public auction, all royalty oil and gas accruing or reserved to the United States under such lease. Such advertisement and sale shall reserve to the Secretary of the Interior the right to reject all bids whenever within his judgment the interest of the United States demands; and in cases where no satisfactory bid is received or where the accepted bidder fails to complete the purchase, or where the Secretary of the Interior shall determine that it is unwise in the public interest to accept the offer of the highest bidder, the Secretary of the Interior, within his discretion, may readvertise such royalty for sale, or sell at private sale at not less than the market price for such period, or accept the value thereof from the lessee: *Provided, however*, That pending the making of a permanent contract for the sale of any royalty, oil or gas as herein provided, the Secretary of the Interior may sell the current product at private sale, at not less than the market price: *And provided further*, That any royalty oil or gas may be sold at not less than the market price at private sale to any department or agency of the United States.

SEC. 37. That the deposits of coal, phosphate, sodium, oil, oil shale, and gas, herein referred to, in lands valuable for such minerals, including lands and deposits described in the joint resolution entitled "Joint resolution authorizing the Secretary of the Interior to permit the continuation of coal mining operations on certain lands in Wyoming," approved August 1, 1912 (Thirty-seventh Statutes at Large, page 1346), shall be subject to disposition only in the form and manner provided in this act, except as to valid claims existent at date of passage of this act and thereafter maintained in compliance with the laws under which initiated, which claims may be perfected under such laws, including discovery.

SEC. 38. That, until otherwise provided, the Secretary of the Interior shall be authorized to prescribe fees and commissions to be paid registers and receivers of the United States land offices on account of business transacted under the provisions of this act.

Approved, February 25, 1920.

REGULATIONS FOR THE OPERATION OF THE ACT OF FEBRUARY 25, 1920.

Under the authority of the act of Congress approved February 25, 1920, entitled "An act to promote the mining of coal, phosphate, oil, oil shale, gas, and sodium on the public domain," the following rules and regulations are prescribed for the administration of the provisions of said act relative to oil and gas:

1. — OIL AND GAS PERMIT

Section 13 of the act authorizes the Secretary of the Interior to grant a qualified applicant the exclusive right to prospect for oil or gas for the period of two years, unless extended, and under authority thereof the following rules and regulations will govern the issuance of such permits:

1. Qualifications of applicants. — Pursuant to section 1 of the act, permits may be issued to (*a*) a citizen of the United States; (*b*) an association of such citizens; (*c*) a corporation organized under the laws of the United States or of any State or Territory thereof; or (*d*) a municipality.

2. Lands to which applicable. — The permit thus issued may include not more than 2560 acres of land wherein such deposits belong to the United States and are not within any known geological structure of a producing oil or gas field, the lands applied for to be taken in a reasonably compact form, by legal subdivisions if surveyed, and in an approximately square or rectangular tract if unsurveyed, the length of which must not exceed two and one-half times its width. Incontiguous tracts within a limited radius may be included in a permit when conditions are such that, because of prior disposals, a reasonable area of contiguous land can not be procured.

Such permits may not include land or deposits in (*a*) national parks; (*b*) forests created under the act of March 1, 1911 (36 Stat., 961), known as the Appalachian Forest Reserve act; (*c*) lands in military or naval reservations; or (*d*) Indian reservations. The application of the act to ceded Indian lands depends on the laws controlling their disposition.

All permits or leases for the exploration for or development of oil or gas deposits under this act within the limits of national forests or other reservations or withdrawals to which this act is applicable shall be subject to and contain such conditions, stipulations, and reservations as the Secretary of the Interior shall deem necessary for the protection of such forests, reservations, or withdrawals, and the uses and purposes for which created.

The boundaries of the geological structures of producing oil or gas fields will be determined by the United States Geological Survey, under the supervision of the Secretary of the Interior, and maps or diagrams showing same will be placed on file in local United States land offices.

It should be understood that under the act, the granting of a prospecting permit for oil and gas is discretionary with the Secretary of the Interior, and any application may be granted or denied, either in part or in its entirety, as the facts may be deemed to warrant.

3. Permits or leases for other materials. — The granting of a permit or lease for the development or production of oil or gas will not preclude other permits or leases of the same land for the mining of other minerals, under this act, with suitable stipulations for such joint operation, to the end that the full development of the mineral resources may be secured, nor will it necessarily preclude the allowance of applicable entries, locations, or selections of the lands included therein with a reservation of the mineral deposits to the United States.

4. Form and contents of application. — Applications for permits should be filed in the proper district land office, addressed to the Commissioner of the General Land Office, be suspended for 30 days to enable preference-right claims to be presented before action, and after due notation then forwarded for his consideration, with a full report as to status and conflicts. No specific form of application is required, and no blanks will be furnished, but it should cover, in substance, the following points, and be under oath:

(*a*) Applicant's name and address.

(*b*) Proof of citizenship of applicant, by affidavit of such fact, if native born; or if naturalized, by a certified copy of the certificate of naturalization on the form provided for use in public-land matters, unless such a copy is already on file; if a corporation, by certified copy of the articles of incorporation, and a showing as to the residence and citizenship of its stockholders; if a municipality a showing of (1) the law or charter and procedure taken by which it has become a legal body corporate; (2) that the taking of a permit or lease is authorized under such law or charter; and (3) that the action proposed has been duly authorized by the governing body of such municipality.

(*c*) A statement that the applicant is not the holder of more than two other subsisting permits in the same State, nor of any permit in the same geologic structure, together with a statement of any other applications for permits in the same State, in which the applicant is directly or indirectly interested, fully disclosing the nature and extent of such interests. In this connection attention is directed to the limitations and exceptions of section 27 of the act.

(*d*) Description of the land for which the permit is desired, by legal subdivisions if surveyed, and by metes and bounds if unsurveyed, in which latter case, if deemed necessary, a survey sufficient more fully to identify the land may be required before the permit is granted. In order to properly identify unsurveyed lands, great care should be taken, and if practicable the metes and bounds description should be connected by course and distance with some corner of the public land surveys.

(*e*) A statement that to the best of applicant's knowledge and belief the land applied for is not within any known geological structure of a producing oil or gas field.

(*f*) Three references as to applicant's reputation and business standing.

(*g*) If the applicant is claiming a preference right as explained in the next succeeding section of these regulations, he should set up fully the facts upon which such preference right is based, together with a true copy of the posted notice.

(*h*) The applicant must furnish a bond, with qualified corporate surety, in the sum of $1000, conditioned against the failure of the permittee to repair promptly, so far as possible, any damage to the oil strata or deposits resulting from improper methods of operation. The penalty of the bond may be increased by the Secretary of the Interior when conditions warrant, particularly in relief cases. This bond may be filed with the application, which will expedite action thereon, or within 10 days after receipt of notice by the applicant that the permit will be granted when the bond is filed.

Additional bonds, or a bond with additional obligations therein, will be required in special cases where a permit embraces reserved deposits in lands theretofore entered or patented with a reservation of the oil and gas to the United States, together with a right to prospect for, mine, and remove the same pursuant to the act of July 17, 1914 (38 Stat., 509), or where the lands constitute a portion of a reclamation project.

A revenue stamp must be attached to the bond at the rate of 1 cent on each $1 or fractional part thereof of premium paid.

The following form of bond is prescribed for use in ordinary cases in connection with applications for permit:

DEPARTMENT OF THE INTERIOR.
GENERAL LAND OFFICE.

U. S. Land Office———
Serial Number———

Bond of oil and gas permittee.

[Act of Feb. 25, 1920 (Public No. 146).]

Know all men by these presents, That we, ——— ———, of the county of ———, in the State of ———, as principal, and ——— ——— of the county of ———, in the State of ———, as surety, are held and firmly bound unto the United States of America in the sum of ——— dollars, lawful money of the United States to be paid to the United States, for which payment, well and truly to be made, we bind ourselves, and each of us, and each of our heirs, executors, administrators or successors, and assigns, jointly and severally by these presents.

Signed with our hands and sealed with our seals this ——— day of ——— in the year of our Lord one thousand nine hundred and ———.

The condition of the foregoing obligation is such that, whereas the said principal has made application under the act of February 25, 1920 (Public No. 146), for a permit to prospect for oil and gas for two years upon the following described lands ————————; and whereas said permit, if granted, will be on condition that all operations shall be conducted in accordance with approved methods; that all proper precautions shall be exercised to prevent waste of oil or gas developed in the lands, or the entrance of water through wells drilled by, or on behalf of, the principal to the oil sands or oil-bearing strata to the destruction of the oil deposits.

Now therefore, if said principal shall promptly repair any damage that may result to the oil strata or deposits resulting from improper methods of operation, or from failure to comply fully with the aforesaid conditions of said permit, then the

above obligation is to be void and of no effect; otherwise to remain in full force and virtue.

Signed, sealed, and delivered in presence of —

Name and address of witness:

——— ———, ——— ——— [L. S.]
Principal.

——— ——— [L. S.]
Surety.

In lieu of corporate surety, the applicant may deposit United States bonds of the par value of not less than $1000, pursuant to section 1320 of the act of February 24, 1919 (see Treasury Circular No. 154, of June 30, 1919). When United States bonds are submitted as security in lieu of corporate surety same should be accompanied with a bond and power of sale duly executed by the applicant in substantially the following form:

DEPARTMENT OF THE INTERIOR.
GENERAL LAND OFFICE.

U. S. Land Office ———
Serial No. ———

Bond of oil and gas permittee where United States bonds are accepted in lieu of surety or sureties, and power of attorney.

[Act of Feb. 25, 1920 (Public No. 146).]

Know all men by these presents, That ——— of ———, State of ———, as obligor, is held and firmly bound unto the United States of America in the sum of $1000, lawful money of the United States, to be paid to the United States, for which payment, well and truly to be made, binds himself, his heirs, executors, administrators, and assigns by these presents.

The condition of the foregoing obligation is such that whereas the said obligor has made application under the act of February 25, 1920 (Public No. 146), for a permit to prospect for oil and gas for two years upon the following-described land: ———; and

Whereas said permit, if granted, will be on condition that all operations shall be conducted in accordance with approved methods; that all proper precautions shall be exercised to prevent waste of oil or gas developed in the lands, or the entrance of water through wells drilled by or on behalf of the obligor to the oil sands or oil-bearing strata to the destruction of the oil deposits.

Now, therefore, if said obligor shall promptly repair any damage that may result to the oil strata or deposits resulting from improper methods of operation, or through failure to comply fully with the aforesaid conditions of said permit, then the above obligation is to be void and of no effect: otherwise to remain in full force and virtue.

The above-bounden obligor, in order the more fully to secure the United States in the payment of the aforesaid mentioned sum, hereby pledges as security therefor bonds of the United States in the principal sum of $1000, which said bonds are

numbered serially and are in the denominations and amounts and are otherwise more particularly described as follows:

——— bonds of $——— bearing ——— per cent interest with ——— coupons attached to each, numbered ———, which said bonds have this day been deposited with the Secretary of the Interior and his receipt taken therefor.

That the said obligor does hereby constitute and appoint the Secretary of the Interior as his attorney, for him and in his name to collect or to sell, assign and transfer the said United States bonds above described and deposited by the obligor as aforesaid, pursuant to authority conferred by section 1320, of the revenue act of 1918, approved February 24, 1919, as security for the faithful performance of any and all of the conditions or stipulations as hereinbefore set out, and it is agreed that, in case of any default in the performance of the conditions and stipulations of such undertaking the said attorney shall have full power to collect said bonds or any part thereof, or to sell, assign, and transfer said bonds or any part thereof without notice, at public or private sale, free from any equity of redemption or without appraisement or valuation, notice and right to redeem being waived, and to apply proceeds of such sale or collection in whole or in part to the satisfaction of any damages, or deficiencies arising by reason of such default, as said attorney may deem best. The interest accruing upon said United States bonds deposited as above stated, in the absence of any default in the performance of any of the conditions or stipulations of the bond, shall be paid to said obligor. The said obligor hereby for himself, his heirs, executors, administrators, and assigns ratifies and confirms whatever his said attorney shall do by virtue of these presents.

In witness whereof I have hereunto set my hand and seal this ——— day of ——— 19—.

——— ———. [L. S.]
Signature.

Before me, the undersigned, a notary public within and for the county of ———, in the State of ———, personally appeared ——— ——— and duly acknowledged the execution of the foregoing bond and power of attorney.

Witness my hand and notarial seal this ——— day of ———, 19—.

——— ———

[Notarial Seal.]

5. Preference right, how secured. — A preference right over others to a permit may be obtained, under section 13 of the act, by —

(*a*) Erecting upon the land desired, subsequent to the approval of the act, a monument not less than 4 feet high, at some conspicuous place thereon, of such a size as to be visible to anyone who may be interested. The monument may be of iron, stone, or durable wood, not less than 4 inches square or in diameter, and must be firmly embedded in the ground.

(*b*) Posting on or near said monument a notice stating that an application for permit will be made within 30 days after date of posting said notice, the notice to give the date and hour of posting, to be signed by the applicant, and give such a general description of the land to be covered by the permit, by reference to courses and distances from such monument and other natural objects and permanent monuments, as will reasonably identify the land. The area, approximately, must also be stated, and the notice must be so protected as to prevent its destruction by the

elements. The preference right will exist for 30 days after the date of posting such notice, and if no application is filed within that time, the land will be subjected to any other application for permit or to other disposal.

(*c*) In cases of conflict between a preference right application and one filed without any claim of preference, the priority of the initiation of the claim will govern; for example, the filing of a proper application in the land office prior to the posting of notice by another, as aforesaid, will give a prior right.

6. Form and requirements of permit. — A permit will confer upon the recipient the exclusive right to prospect for oil or gas upon the lands embraced therein, provided he complies with the terms thereof, which permit will be, in form and substance, substantially as follows:

The United States of America.
department of the interior.
General Land Office.

U. S. Land Office ———
Serial Number ———

Know all men by these presents, That the Secretary of the Interior, under and by virtue of the act of Congress entitled "An act to promote the mining of coal, phosphate, oil, oil shale, gas, and sodium on the public domain," approved February 25, 1920, has granted and does hereby grant a permit to ——— ——— granting ——— the exclusive right for ——— years from date hereof to prospect for oil or gas, but for no other purpose, the following described lands: ———, upon the express conditions following:

1. To mark each of the corners of the claim within 90 days from date hereof with substantial monuments so that the boundaries can be readily traced on the ground, and post in a conspicuous place, upon the lands covered hereby, a notice that such a permit has been granted, and a description of the lands covered by this permit.

2. Within six months (two years in Alaska) from date hereof to install upon some portion of the lands a substantial and adequate drilling outfit and to commence actual drilling operations.

3. Within one year (three years in Alaska) from date hereof to drill one or more wells, not less than 6 inches in diameter to a depth of at least 500 feet each, unless valuable deposits of oil or gas shall be sooner discovered.

4. Within two years (four years in Alaska) from date hereof to drill one or more wells to a depth of at least 2000 feet, unless valuable deposits of oil or gas shall be sooner discovered.

5. Not to drill any well within 200 feet of any of the outer boundaries of the lands covered by this permit unless the adjoining lands have been patented or the title thereto otherwise vested in private owners.

6. To carry on all operations hereunder in accordance with approved methods and practice; to use all reasonable precautions to prevent waste of oil or gas developed in the land, or the entrance of water through wells drilled by permittees to the oil sands or oil-bearing strata to the destruction or injury of the oil deposits, and to carry out, at the expense of the permittee, all reasonable orders of the Secretary of the Interior relative to prevention of waste and preservation of property,

and to comply with such regulations as may be issued by the Secretary of the Interior as to methods of operation.

7. To furnish and maintain during the period of this permit a bond with qualified corporate surety in the sum of $———, conditioned against the failure of the permittee to repair promptly, so far as possible, any damage to the oil strata or deposits resulting from improper methods of operation.

8. That as to any lands covered by this permit embraced at the date hereof in any entry or patent with a reservation of the oil and gas deposits to the United States pursuant to the act of July 17, 1914 (38 Stat., 509), or the act of December 29, 1916 (39 Stat., 862), permittee shall reimburse such entrymen or patentee for all damage to crops and improvements caused by drilling or other prospecting operations.

9. That this permit is granted upon the express condition that the right is reserved to the Secretary of the Interior to permit upon such terms as he may determine to be just, for joint or several use, such easements or rights of way, including easements in tunnels upon, through, or in the lands covered thereby, as may be necessary or appropriate to the working of the same, or of other lands containing the deposits described in the act under which this permit is granted.

10. This permit is granted on the express condition that if any of the land covered thereby is embraced in a forest, reclamation, power, or other withdrawal, or is segregated for any particular purpose operations under this permit shall be so conducted as not to interfere with the administration and use of the land for the purpose for which withdrawn or segregated to a greater extent than may be determined by the Secretary of the Interior to be necessary for the most beneficial use of the land.

11. The granting of this permit shall not preclude the allowance of entry, location, or selection of any of the lands included therein, where such entry, selection, or location is made with a reservation of the mineral deposits to the United States.

12. That until this permittee shall apply for a lease of one-quarter or more of the area included herein, he shall pay to the United States 20 per cent of the gross value of all oil or gas secured by him from the lands and sold or otherwise disposed of, or held by him for sale or other disposition.

13. The Secretary of the Interior reserves the right and authority to cancel this instrument for failure of the permittee to comply with any of the conditions enumerated herein or to exercise due diligence in the work of development.

14. Valid rights existing at the date of this permit will not be affected thereby.

Dated this ——— day of ———, 19—.

———— ————,

Secretary of the Interior.

7. Extension of life of permit. — If for any good reason the permittee is unable, with the exercise of diligence, to test the land within two years, application for extension for not to exceed two years may be filed within the life of the permit, and must be accompanied by a showing under oath, corroborated, as to the causes that make such extension necessary, and as to what efforts have been made to comply with the condition of the permit; ordinarily no extension will be granted in the absence of the minimum amount of drilling required by the permit. This application should be addressed to the Secretary of the Interior, and be filed either in the

district land office or in the General Land Office. This privilege is not applicable to Alaska.

8. Reward for discovery. — Upon establishing to the satisfaction of the Secretary of the Interior that valuable deposits of oil or gas have been discovered within the limits of the land embraced in the permit, within the period of the permit or extension thereof, the permittee is entitled (*a*) to a lease of one-fourth of the land included in the permit, on a royalty of 5 per cent, or for at least 160 acres if there be that area in the permit; (*b*) to a preference right to a lease for the remainder of the land covered by his permit at such royalty as may be fixed by the Secretary of the Interior, not less than $12\frac{1}{2}$ per cent in amount or value of the production, nor more than the royalties fixed for leases under section 18 of the act (sec. 19, par. *c*, of these regulations), except that on that portion of the average production exceeding 200 barrels per day per well for the calendar month, the royalties shall be $33\frac{1}{3}$ per cent for oil of 30 degrees Baumé or over and 25 per cent for oil of less than 30 degrees Baumé.

9. Penalty for default. — The permit will be subject to cancellation by the Secretary of the Interior for failure of the permittee to comply with any of the conditions enumerated therein or to exercise due diligence in the work of development.

In the absence of discovery of oil or gas within the period of the permit or extension thereof, the permit will thereupon terminate and the lands or deposits will automatically revert to their original status, but the land will continue segregated pending action by the Land Department on any application for extension that is timely filed.

10. Permits in Alaska. — The foregoing rules and regulations generally will apply to permits in Alaska, under section 13 of the act, but with some modifications, viz:

(*a*) A person, association, or corporation is authorized to hold five permits at one time in said territory, but only one permit in the geologic structure of any one producing oil field; hence subdivision *c* of section 4 of these regulations should be modified accordingly in making application for permits for lands in Alaska under section 13 of the act.

(*b*) The preference right treated under section 5 of these regulations extends for a period of six months after the erection of monument and posting of notice provided for therein, and the period for marking of the corners is extended to one year after the granting of the permit.

(*c*) The time for exploratory work in Alaska is four years, instead of two, and there is no provision for extension of such period. The various items necessary in this exploratory work are set forth in the form of permit herein provided, the Alaskan period being included in parentheses, after the period prescribed in the States.

11. Permits for reserved deposits. — The deposits of oil and gas in all lands for which a patent has issued with a reservation of the oil and gas to the United States, under the act of July 17, 1914 (38 Stat., 509), subject to the preference right, if any, explained in the next succeeding section hereof, may be included in a permit under the provisions of this act, conditioned upon the permittee filing with the Secretary of the Interior a satisfactory bond or undertaking as security for the payment of all damages to crops and improvements on such lands by reason of prospecting, as required by the said act. (See G. L. O. Circular No. 393, 44 L. D., 32.)

12. Preference right of owner of surface. — Under section 20 of the act a preference right to a prospecting permit is given to an entryman or owner of land not claimed under any railroad grant, under the following conditions: (1) The entry must have been made prior to February 25, 1920; (2) the entry must have been bona fide under and pursuant to the act under which made; (3) the entry must have been made without a reservation of the oil and gas, for land unwithdrawn, not classified as oil and gas land, and not known to be valuable for its oil or gas deposits, at date of entry; (4) in case the entry is patented, it must have been with a reservation of the oil and gas to the Government; if the entry is not patented, the entryman must waive all right *under the entry* to the oil and gas in the land; (5) if the entry has been assigned or transferred, such assignment or transfer must have been prior to January 1, 1918.

(*a*) Should an application for permit for entered or patented lands *with a reservation* of the oil and gas content to the United States be filed by a person other than the entryman or owner of the land, the applicant will be required to serve *personal notice* of such application upon the owner or owners of the land so entered or patented, with a warning therein that if said owner desires to exercise his preference right, if any, to a permit, he must file within 30 days his application therefor in the proper local land office. The applicant must furnish evidence of the service of notice on the owner and evidence that the party served is the owner of the land involved, either by his affidavit, duly corroborated, or by certificate of the officer in whose office transfers of real property are to be recorded.

(*b*) The preference-right applicant must show that he is entitled under the section above outlined, together with his qualifications, to hold a permit as previously set forth in these regulations, and if such an application be filed, the Secretary of the Interior will award the permit to the party entitled thereto.

(*c*) If the land, either withdrawn or unwithdrawn, is covered by an unpatented nonmineral entry *without a reservation* of the oil and gas content to the Government, a prospecting permit may not be granted so long as the entry subsists without such reservation. In cases where applications for prospecting permits are filed by persons other than the entrymen for land in this status such applications will be referred to the United States Geological Survey for classification as to the prospective oil value of the land affected. If the Geological Survey shall conclude and report that the land embraced in such a nonmineral entry is without prospective oil or gas value, the application for permit will be rejected as to such land; but if the Geological Survey shall report that the land has a prospective oil or gas value and offers a favorable opportunity for prospecting operations, then the General Land Office will direct the proper local officers to serve notice on the nonmineral entryman to the effect that said land has been reported as valuable for its oil or gas content, and that the said entryman will be allowed fifteen (15) days within which (1) to file in the local office his consent to a reservation to the Government of the oil and gas content of the land embraced in his entry and in which to exercise his preference right, if any, to a prospecting permit for said land by filing a proper application therefor, or (2) to show cause, if any there be, why he should not consent to the mineral reservation, failing in either of which his entry will be canceled without further notice. The local office will thereupon report the action taken to the commissioner, whereupon (1) if the nonmineral entryman shall have failed to take

any action, order of cancellation of the nonmineral entry will be made and action taken on the prospecting permit accordingly; (2) if consent to the reservation shall have been filed, a prospecting permit will be granted to the entryman or the former applicant, as the case may be, for the reserved mineral deposits; (3) if the nonmineral entryman shall submit a showing why the entry should not be impressed with a reservation of the mineral to the Government, such showing will be referred to the Geological Survey for consideration and report. If upon the receipt of such report the department shall conclude that the land is without mineral value, the application for prospecting permit will be rejected; but if the department shall conclude that, notwithstanding the showing made by the entryman, the land has a prospective oil and gas value, such action will be taken as the facts may warrant.

From the above it will be seen that it is desirable on the part of any applicant for a prospecting permit for land already embraced in a nonmineral entry without a reservation of the mineral, and likewise desirable on the part of any nonmineral entryman who is contending that the land is nonmineral in character, to submit with their respective applications or showings as complete and accurate geological data as may be procurable, preferably the reports and opinions of qualified experts.

(*d*) In case of conflict between a preference-right claim under section 20 of the act and one claimed by virtue of section 18 or 19, the issue will be determined on the basis of priority.

(*e*) Claimants under this section of the act may combine their holdings for the purpose of making joint application for a permit, provided the aggregate area does not exceed 2560 acres and that all the lands for which application is made are within an area of 6 miles square or within the same township.

(*f*) The right of a permittee under a preference-right permit to a lease after discovery is governed by other provisions of the act, as set forth in section 8 of these regulations.

12½. Assignment of permits. — Permits, after being awarded, may be assigned to qualified persons or corporations upon first obtaining consent of the Secretary of the Interior. Mere rights to receive a permit are not assignable.

II. — OIL AND GAS LEASES

13. Designation and offer of lands for lease. — Pursuant to the provisions of section 17 of the act, the unappropriated deposits of oil or gas situated within known geologic structures of producing oil or gas fields, and the lands containing same, will be divided into leasing blocks or tracts in areas not exceeding 640 acres each, and not exceeding in length two and one-half times their width, and offered for lease at a stated royalty by competitive bidding to the highest responsible bidder having the qualifications prescribed by section 15, paragraph (*a*) hereof.

14. Notice of lease offer. — Notice of the offer of lands for lease will be given by publication in a newspaper of general circulation in the county in which the lands or deposits are situated for a period of 30 days; such notice will state the day and hour on which the offering will be made at public auction at the United States land office of the district in which the lands are situated, to the qualified bidder offering the highest bonus for the lease at the stated rental and royalty. Copy of the notice will be posted in said local office during the period of publication.

This notice will be published at the expense of the Government. All bidders at any such auction are warned against violation of the provisions of section 59 of the United States Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders.

15. Auction of lease. — At the time fixed in the notice, the register or receiver will, by public auction, offer the land for lease on the terms and conditions as to payments of royalties and rents fixed in the notice, to the qualified bidder of the highest amount offered as a bonus for the privilege of leasing the land. The successful bidder must deposit with the receiver on the date of the sale, certified check on a solvent bank, or cash, for one-fifth of the amount bid by him, which payment the receiver will credit to "Trust funds — Unearned moneys." At the time of such payment the successful bidder will also file the requisite showing of his qualifications to receive a lease, which shall include the following:

(*a*) Proof of citizenship of applicant; by affidavit of such fact, if native born, or if naturalized, by certified copy of the certificate of naturalization, on the form provided for use in public land matters, unless such copy is already on file; if a corporation, by certified copy of the articles of incorporation and a showing as to the residence and citizenship of its stockholders.

(*b*) The affidavit of the bidder or the affidavit of one of the officers of a corporate bidder that the bidder does not hold another lease in the geologic structure of the same producing oil or gas field, nor more than two leases, or a lease and a permit, in the State, except under sections 18, 18*a*, 19, and 22 of the act; and also that the acceptance of the lease by such successful bidder will not be in violation of the provisions of section 27 of the act relative to excess holdings by individuals or corporations.

The register and receiver will thereupon transmit such showing, together with a report of the proceedings had at the auction, by special letter to the Commissioner of the General Land Office.

16. Award of lease. — On receipt of the report of the auction from the register and receiver, the Secretary of the Interior will take action thereon, and either award the lease to the successful bidder or reject same, notice of which will be forthwith transmitted to the bidder through the local office. If the lease shall be awarded, the notice will be accompanied by copies of leases for execution by the lessee, who shall, within 30 days from receipt of such notice, execute said lease in triplicate, and pay to the receiver the balance of the bonus bid by him, together with the first year's rental, and also cause to be filed in the Land Office the bond required by section 2 (*a*) of the lease; in lieu of such bond, Liberty bonds will be taken at par in the amount of the bond, as provided in the act of February 24, 1919 (40 Stat., 1148). If the bid be rejected, the receiver will return by his official check the deposit made at the auction. In case of the award of a lease and failure on the part of the bidder to execute same, and otherwise comply with the applicable regulations, the deposit made will be considered forfeited and disposed of as other receipts under this act.

17. Form of lease. — The lease referred to in the preceding sections will be in form and substance substantially as follows:

U. S. Land Office ———
Serial No. ———

DEPARTMENT OF THE INTERIOR.

Lease of oil and gas lands under the act of February 25, 1920.

Date — Parties. — This indenture of lease entered into, in triplicate, this ——— day of ——— A. D., 19—, by and between the United States of America, acting in this behalf by the Secretary of the Interior, party of the first part, hereinafter called the lessor, and ——— of ———, party of the second part, hereinafter called the lessee, under, pursuant, and subject to the terms and provisions of the act of Congress approved February 25, 1920, Public No. 146, entitled "An act to promote the mining of coal, phosphate, oil, oil shale, gas, and sodium on the public domain," hereinafter referred to as the act, which is made a part hereof, witnesseth:

SECTION 1. *Purposes.* — That the lessor in consideration of rents and royalties to be paid, and the covenants to be observed as herein set forth, does hereby grant and lease to the lessee the exclusive right and privilege to drill for, mine, extract, remove, and dispose of all the oil and gas deposits in or under the following described tracts of land situated in the county of ———, State of ———, and more particularly described as follows: ——— containing ——— acres, more or less, together with the right to construct and maintain thereupon all works, buildings, plants, waterways, roads, telegraph or telephone lines, pipe lines, reservoirs, tanks, pumping stations, or other structures necessary to the full enjoyment hereof, for a period of 20 years, with the preferential right in the lessee to renew this lease for successive periods of 10 years, upon such reasonable terms and conditions as may be prescribed by the lessor, unless otherwise provided by law at the time of the expiration of such periods.

SEC. 2. In consideration of the foregoing, the lessee hereby agrees:

(*a*) *Bond.* — To furnish a bond with approved corporate surety in the penal sum of $5000, conditioned upon compliance with the terms of the lease.

(*b*) *Commence drilling.* — The lessee agrees, within three months from delivery of executed lease, to proceed with reasonable diligence to install on the leased ground a standard or other efficient drilling outfit and equipment, and to commence drilling at least one well, and to continue such drilling with reasonable diligence to production, or to a point where the well is demonstrated unsuccessful, and thereafter to continue drilling with reasonable diligence at least one well at a time until the lessee shall have drilled wells equal in number to the number of 40-acre tracts embraced in the leased premises, unless the lessor shall, for any reason deemed sufficient, consent in writing to the drilling of a less number of wells; the lessee further agrees to drill all necessary wells fairly to offset the wells of others on adjoining land or deposits not the property of the United States.

(*c*) *Royalty and rents.* — To pay the lessor in advance, beginning with the date of the execution of this lease, a rental of $1 per acre per annum during the continuance hereof, the rental so paid for any one year to be credited on the royalty for that year, and, in addition to such rental, a royalty of ——— per cent of the value of oil or gas produced from the land leased herein (except oil or gas used for production purposes on said lands or unavoidably lost), or, on demand of the lessor, ——— per cent of the oil or gas produced (except oil or gas used for production purposes on said lands, or unavoidably lost), in which case credit for rent shall be on the basis

of the current field price of oil, the royalty, when paid in value, to be due and payable monthly on the 15th of each month following the month in which produced, to the receiver of public moneys of the proper land district; and when paid in kind, to be delivered in the field where produced at such times, and in such manner as may be required by the lessor; such royalties, whether in value or kind, shall be subject to reduction whenever the average daily production of any oil well shall not exceed 10 barrels per day, if in the judgment of the lessor the wells can not be successfully operated upon the royalties fixed herein.

(*d*) *Sales contract.* — To file with the Secretary of the Interior copies of all sales contracts for the disposition of oil and gas produced hereunder, except for production purposes on the land leased, and, in the event the United States shall elect to take its royalties in money instead of in oil or gas, not to sell or otherwise dispose of the products of the land leased, except in accordance with a sales contract or other method first approved by the Secretary of the Interior.

(*e*) *Monthly statement.* — To furnish monthly statements in detail in such form as may be prescribed by the lessor, showing the amount, quality, and value of all oil and gas produced and saved during the preceding calendar month as the basis for computing the royalty due the lessor. The leased premises, and all wells, improvements, machinery, and fixtures thereon or connected therewith, and all books and accounts of the lessee shall be open at all times for the inspection of any duly authorized officer of the department.

(*f*) *Plats and reports.* — To furnish annually and at such times as the Secretary shall require, in the manner and form prescribed by the Secretary of the Interior, a plat showing all development work and improvements on the leased lands, and other related information, with a report as to all buildings, structures, or other works placed in or upon said leased lands, accompanied by a report in detail as to the stockholders, investment, depreciation, and cost of operation, together with a statement as to the amount and grade of oil and gas produced and sold, and the amount received therefor, by operations hereunder.

(*g*) *Log of wells.* — To keep a log in the form prescribed by the Secretary of all the wells drilled by the lessee, showing the strata and character of the ground passed through by the drill, which log, or copy thereof, shall be furnished to said lessor on demand.

(*h*) *Diligence — Prevention of waste — Health and safety of workmen.* — To exercise reasonable diligence in drilling and operating wells for the oil and gas on the lands covered hereby while such products can be secured in paying quantities, unless consent to suspend operations temporarily is granted by the Secretary of the Interior; to carry on all operations hereunder in a good and workmanlike manner, in accordance with approved methods and practice, having due regard for the prevention of waste of oil or gas developed on the land, or the entrance of water through wells drilled by the lessee to the oil sands or oil-bearing strata, to the destruction or injury of the oil deposits, the preservation and conservation of the property for future productive operations, and to the health and safety of workmen and employees; to plug securely any well before abandoning the same so as to effectually shut off all water from the oil or gas bearing strata; not to drill any well within 200 feet of any of the outer boundaries of the lands covered hereby unless the adjoining lands have been patented or the title thereto otherwise vested in private owners; to conduct all mining, drilling, and related productive operations

subject to the inspection of the lessor; to carry out at expense of the lessee all reasonable orders and requirements of lessor relative to prevention of waste and preservation of the property and the health and safety of workmen, and on failure so to do the lessor shall have the right to enter on the property to repair damage or prevent waste at lessee's cost; to abide by and conform to regulations in force at the time the lease is granted covering the matters referred to in this paragraph: *Provided*, That lessee shall not be held responsible for delays or casualties occasioned by causes beyond lessee's control.

(*i*) *Taxes and wages — Freedom of purchase.* — To pay when due all taxes lawfully assessed and levied under the laws of the State upon improvements, oil, and gas produced from the lands hereunder, or other rights, property, or assets of the lessee; to accord all workmen and employees complete freedom of purchase, and to pay all wages due workmen and employees at least twice each month in the lawful money of the United States.

(*j*) *Reserved deposits.* — To comply with all statutory requirements and regulations thereunder, if the lands embraced herein have been or shall hereafter be disposed of under laws reserving to the United States the deposits of oil and gas therein, subject to such conditions as are or may hereafter be provided by the laws reserving such oil or gas.

(*k*) *Excess holdings.* — To observe faithfully the provisions of section 27 of the act defining the interest or interests that may be taken, held, or exercised under leases authorized by said act.

(*l*) *Assignment of lease.* — Not to assign this lease or any interest therein, nor subtlet any portion of the leased premises, except with the consent in writing of the Secretary of the Interior first had and obtained.

(*m*) *Deliver premises in case of forfeiture.* — To deliver up the premises leased, with all permanent improvements thereon, in good order and condition in case of forfeiture of this lease.

Sec. 3. The lessor expressly reserves:

(*a*) *Rights reserved — Easements and rights of way.* — The right to permit for joint or several use such easements or rights of way, including easements in tunnels upon, through, or in the lands leased, occupied, or used as may be necessary or appropriate to the working of the same or of other lands containing the deposits described in said act, and the treatment and shipment of products thereof by or under authority of the Government, its lessees, or permittees, and for other public purposes.

(*b*) *Disposition of surface.* — The right to lease, sell, or otherwise dispose of the surface of the lands embraced within this lease under existing law or laws hereinafter enacted in so far as said surface is not necessary for the use of the lessee in the extraction and removal of the oil and gas therein.

(*c*) *Pipe lines to convey at reasonable rates.* — The right to require the lessee, his assignee, or beneficiary, if owner, or operator of, or owner of a controlling interest in any pipe line, or any company operating the same which may be operated accessible to the oil derived from lands under such lease, to accept and convey at reasonable rates and without discriminating the oil of the Government or of any citizen or company, not the owner of any pipe line, operating a lease or purchasing oil or gas under the provisions of this act.

(*d*) *Monopoly and fair prices.* — Full power and authority to carry out and

enforce all the provisions of section 30 of the act, to insure the sale of the production of such leased lands to the United States and to the public at reasonable prices to prevent monopoly and to safeguard the public welfare.

(*e*) *Helium.* — Pursuant to section 1 of the act, the lessor reserves the right to take all helium from any gas produced under this lease, but the lessee shall not be required to extract and save the helium for the lessor; in case the lessor elects to take the helium, the lessee shall deliver all gas containing same, or portion thereof desired, to the lessor in the manner required by the lessor, for the extraction of the helium in such plant or reduction works for that purpose as the lessor may provide, whereupon the residue shall be returned to the lessee with no substantial delay in the delivery of gas produced from the well to the purchaser thereof; provided, that the lessee shall not, as a result of the operation in this section provided for, suffer a diminution in value of the gas from which the helium has been extracted, or loss otherwise, for which the lessee is not reasonably compensated, save for the value of the helium extracted; the lessor further reserves the right to erect, maintain, and operate any and all reduction works and other equipment necessary for the extraction of helium on the premises leased.

Sec. 4. *Surrender and termination of lease.* — The lessee may, on consent of the Secretary of the Interior first had and obtained in writing, surrender and terminate this lease upon the payment of all rents, royalties, and other obligations due and payable to the lessor, and upon payment of all wages and moneys due and payable to the workmen employed by the lessee, and upon a satisfactory showing to the Secretary that the public interest will not be impaired; but in no case shall such termination be effective until the lessee shall have made full provision for conversation and protection of the property; upon like consent had and obtained the lessee may surrender any legal subdivisions of the area included herein.

Sec. 5. *Purchase of materials, etc., on termination of lease.* — Upon the expiration of this lease, or the earlier termination thereof pursuant to the last preceding section, the lessor or another lessee may, if the lessor shall so elect within six months from the termination of the lease, purchase all materials, tools, machinery, appliances, structures, and equipment placed in or upon the land by the lessee, and in use thereon as a necessary or useful part of an operating or producing plant, on the payment to the lessee of such sum as may be fixed as a reasonable price therefor by a board of three appraisers, one of whom shall be chosen by the lessor, one by the lessee, and the other by the two so chosen; pending such election all equipment shall remain in normal position. If the lessor, or another lessee, shall not, within six months, elect to purchase all or any part of such materials, tools, machinery, appliances, structures, and equipment, the lessee shall have the right at any time, within 90 days, to remove from the premises all the materials, tools, machinery, appliances, structures, and equipment which the lessor shall not have elected to purchase, save and except casing in wells and other equipment or apparatus necessary for the preservation of the well or wells.

Sec. 6. *Judicial proceedings in case of default.* — If the lessee shall fail to comply with the provisions of the act or make default in the performance or observance of any of the terms, covenants, and stipulations hereof, or of the general regulations promulgated and in force at the date hereof, and such default shall continue after service of written notice thereof by the lessor, then the lessor may institute appropriate judicial proceedings for the forfeiture and cancellation of this lease in accord-

ance with the provisions of section 31 of said act; but this provision shall not be construed to prevent the exercise by the lessor of any legal or equitable remedy which the lessor might otherwise have. A waiver of any particular cause of forfeiture shall not prevent the cancellation and forfeiture of this lease for any other cause of forfeiture, or for the same cause occurring at any other time.

Sec. 7. *Heirs and successors in interest.* — It is further covenanted and agreed that each obligation hereunder shall extend to and be binding upon and every benefit hereof shall inure to the heirs, executors, administrators, successors, or assigns of the respective parties hereto.

Sec. 8. *Unlawful interest.* — It is also further agreed that no Member of or Delegate to Congress or Resident Commissioner, after his election or appointment, or either before or after he has qualified, and during his continuance in office, and that no officer, agent, or employee of the Department of the Interior shall be admitted to any share or part in this lease or derive any benefit that may arise therefrom, and the provisions of section 3741 of the Revised Statutes of the United States, and sections 114, 115, and 116 of the Codification of the Penal Laws of the United States approved March 4, 1909 (35 Stat., 1109), relating to contracts enter into and form a part of this lease so far as the same may be applicable.

In witness whereof

THE UNITED STATES OF AMERICA,
By——— ——— [L. S.]

Witness:
——— ——— ——— ——— [L. S.]
——— ——— ——— ——— [L. S.]
——— ——— ——— ——— [L. S.]

Bond required under paragraph 2a of the lease should be in substantially the following form:

DEPARTMENT OF THE INTERIOR
GENERAL LAND OFFICE

U. S. Land Office ———
Serial Number ———

Bond of oil and gas lessee.

[Act of Feb. 25, 1920 (Public No. 146).]

Know all men by these presents, That we, ——— ———, of the county of ———, in the State of ———, as principal, and ——— of the county of ———, in the State of ———, as surety, are held and firmly bound unto the United States of America in the sum of ——— dollars, lawful money of the United States, for the use and benefit of the United States and of any entryman or patentee of any portion of the land covered by the hereinafter described lease heretofore entered or patented with a reservation of the oil and gas deposits to the United States, to be paid to the United States, for which payment, well and truly to be made, we bind ourselves, and each of us, and each of our heirs, executors, administrators, successors, and assigns, jointly and severally by these presents.

Signed with our hands and sealed with our seals this ——— day of ———, in the year of our Lord one thousand nine hundred and ———.

The condition of the foregoing obligation is such that —

Whereas the said principal, by instrument dated ———, has been granted the exclusive right to drill for, mine, extract, remove, and dispose of all the oil and gas deposits in or under the following described lands ————, under and pursuant to the provisions of the act approved February 25, 1920 (Public No. 146); and

Whereas the said principal has by such instrument entered into certain covenants and agreements set forth therein, under which operations are to be conducted:

Now, therefore, if said principal shall faithfully comply with all the provisions of the above described lease, then the above obligation is to be void and of no effect, otherwise to remain in full force and virtue.

Signed, sealed, and delivered in presence of —

Name and address of witness:

——— ——— ——— ——— [L. S.]
Principal.

——— ——— ——— ——— [L. S.]
Surety.

Where Government bonds are deposited as security in lieu of a surety bond, in compliance with paragraph 2 (*a*) of the lease form, same should be accompanied with a combined bond and power of attorney to sell, duly executed by the lessee, along the same general lines as the form set out in paragraph 4 (*h*) of these regulations with suitable changes made in the condition of the bond to correspond with the condition in the lease bond, form for which is above set out.

III. — RELIEF MEASURES

Sections 18, 19, and 22 of the act provide for the "relief," so called, of certain defined claimants of oil and gas lands, who at date of the act had not perfected their claims under the preexisting mining laws, and are prevented from doing so by withdrawal of the land or by this act.

18. Conditions for relief under section 18:

(*a*) That the land claimed must have been included in the Executive order of withdrawal of September 27, 1909, and must have remained so withdrawn.

(*b*) That the claim must have been initiated under the placer mining laws prior to July 3, 1910, and claimed and possessed continuously from that time.

(*c*) That no claimant who has acquired any interest in the land since September 1, 1919, from another claimant who, on that date or since that time, was, or is claiming or holding, more than the maximum allowed a claimant under section 18 of the act, may secure a lease under section 18, or any interest therein. This limitation does not, however, apply to an exchange of an interest in such lands made prior to January 1, 1920, which did not increase or reduce the area or acreage held or claimed, in excess of the maximum by either party to the exchange.

(*d*) That claimant or predecessors must have drilled an oil or gas well on the land to discovery.

(*e*) That all conflicting claims asserted prior to July 1, 1919, must have been disposed of, as provided in section 28 hereof or otherwise.

(*f*) That no claimant who has been guilty of any fraud or who had knowledge

or reasonable grounds to know of any fraud, or who has not acted honestly and in good faith, shall be entitled to any of the benefits of this section.

(*g*) That claimant must, on or before August 25, 1920, file a relinquishment to the United States of all right, title, and interest in and to the land, together with an application for a lease. This relinquishment may be in the form of an unconditional quitclaim deed, duly executed and acknowledged, but not recorded, and when filed will be held for such action as the facts and the law in the case warrant and require.

(*h*) That claimant must pay for one-eighth of the value at the time of production of all oil and gas produced prior to date of filing relinquishment and application for relief, exclusive of oil and gas used on the land for production purposes, or unavoidably lost.

19. Relief that may be granted under section 18:

(*a*) *Lands not in naval petroleum reserves.* — A qualified claimant, upon complying with the provisions of the act and these regulations, will be entitled to a 20-year lease from the United States, commencing and effective as of the date of filing relinquishment and application for relief, substantially in the form prescribed in section 17 hereof, at a royalty to be fixed by the Secretary of the Interior, but not less than 12½ per cent of all oil and gas produced exclusive of that used for production purposes on the claim, or unavoidably lost. There is, however, a limitation placed by the act upon the acreage that may be included in such lease. If the geologic oil or gas structure of the producing field in which the claim is situated does not exceed 640 acres in area the lease may include the entire area if covered by the claim; but if the area of such structure exceeds 640 acres the act provides that not more than one-half of the area, same to be selected by the claimant but in no case to exceed 3200 acres, may be leased to any one claimant.

(*b*) *Lands in naval petroleum reserves.* — If the land claimed is within a naval petroleum reserve the claimant will be entitled to lease only the producing wells on the claim, together with an area of land sufficient for the operation of such wells, upon a royalty to be fixed by the Secretary of the Interior, but not less than 12½ per cent of the production, except that used for production purposes on the claim or unavoidably lost. The act forbids the drilling of any wells in lands subject to this provision within 660 feet of the leased wells without the consent of the lessee. It further provides that the President may, in his discretion, lease the remainder or any part of the claim on which such wells have been drilled, and in the event of such leasing the claimant shall have a preference to such lease. The President may also permit the lessee of any well to drill additional wells within the limited area of 660 feet upon such terms and conditions as he may prescribe. These terms and conditions can not be prescribed here, but will be determined on the merits in each separate case.

(*c*) *Royalties.* — The royalties payable under leases granted pursuant to section 18 of the act are cumulative, and are hereby determined and prescribed as follows:

For all oil produced of 30° Baumé or over upon each claim on which the wells average not exceeding 20 barrels per day per well for the calendar month, 12½ per cent; upon each claim on which the wells average more than 20 barrels and not more than 50 barrels per day per well for the calendar month, 16⅔ per cent; upon each claim on which the wells average more than 50 barrels and not more than 100 barrels per day per well for the calendar month, 20 per cent; upon each claim on which

the wells average more than 100 barrels per day per well for the calendar month, 25 per cent.

For all oil produced of less than 30° Baumé upon each claim on which the wells average not exceeding 20 barrels per day per well for the calendar month, $12\frac{1}{2}$ per cent; upon each claim on which the wells average more than 20 barrels and not more than 50 barrels per day per well for the calendar month, $14\frac{2}{7}$ per cent; upon each claim on which the wells average more than 50 barrels and not more than 100 barrels per day per well for the calendar month, $16\frac{2}{3}$ per cent; upon each claim on which the wells average more than 100 barrels per day per well for the calendar month, 20 per cent.

Only wells which have a commercial production during at least a part of the month shall be considered in ascertaining the average production herein, and the Secretary of the Interior shall determine what are commercially productive wells under this provision.

The royalties on gas produced, if any, will be fixed and determined in each lease.

20. Conditions for relief under section 19:

A. *For permit.* — (*a*) That the land must not be in a naval petroleum reserve.

(*b*) The applicant or his predecessor in interest must have been an occupant or claimant of the land on or before October 1, 1919, under a claim initiated under the placer mining laws, when the land was not withdrawn, provided that a transferee of such a claim subsequent to October 1, 1919, will not be permitted to hold permits under section 19 of the act to exceed 2560 acres in the same geologic structure, nor for more than three times that area in the same State.

(*c*) That claimant, by himself or predecessor in interest, must have performed all acts under the preexisting laws necessary to valid locations, except to make discovery.

(*d*) That prior to February 25, 1920, claimant must have performed work or expended on or for the benefit of such locations an amount equal in the aggregate to $250 for each location.

(*e*) That no claimant who has been guilty of any fraud or who had knowledge, or reasonable grounds to know of any fraud, or who has not acted honestly and in good faith, shall be entitled to any of the benefits of this section.

(*f*) That claimant must, on or before August 25, 1920, file a relinquishment to the United States of all right, title, and interest in and to the land, together with an application for a permit. This relinquishment may be in the form of an unconditional quit-claim deed, duly executed and acknowledged, but not recorded, and when filed will be held for such action as the facts and the law in the case warrent and require.

B. *For lease.* — The conditions necessary to obtaining a lease under section 19 of the act are identical with those outlined in paragraphs (*a*), (*b*), (*e*), and (*f*), for permits, together with the following additional conditions:

(*a*) That claimant must have made a discovery of oil or gas on or before February 25, 1920.

(*b*) That claimant must not be entitled to relief on the land in question under section 18 of the act.

(*c*) That claimant must pay for one-eighth of the past production up to date of filing application for relief, exclusive of that used on the land for production purposes or unavoidably lost.

21. Relief that may be granted under section 19:

(*a*) A claimant qualified under the above conditions relating to permits, upon complying with the provisions of the act and these regulations, will be entitled to a prospecting permit upon the same terms, conditions, and limitations as to acreage, as other permits provided for in the act, substantially in form prescribed in section 6 hereof.

(*b*) A claimant qualified under the above conditions relating to leases is entitled to a 20-year lease from the United States, effective from date of filing application for relief, substantially in the form prescribed in section 17 hereof, the royalty to be fixed by the Secretary of the Interior, but such royalty may not be less than 12½ per cent of all oil and gas produced exclusive of that used for production purposes on the land or unavoidably lost. In the event the land is in the geologic structure of proven territory at the time of granting the permit under this section, the royalty required under the lease based thereon shall not be less than 12½ per cent, but if at the time the permit is granted the land is not in proven territory the amount of royalty will be governed by the general terms of the act as set out in section 14 thereof.

22. Alaska claims — Conditions for relief under section 22:

A. *For permit.* — (*a*) That claimant must have been an occupant or claimant of the land on February 25, 1920, under a claim initiated under the placer mining laws by claimant or predecessors prior to November 3, 1910, the date of the Executive order withdrawing all public lands in Alaska containing petroleum deposits, including those in national forests.

(*b*) That claimant must have performed all acts prior to November 3, 1910, under the then existing laws necessary to valid locations except to make discovery.

(*c*) That claimant, (1) prior to November 3, 1910, must have made substantial improvements for the discovery of oil or gas on or for each location, or (2) prior to February 25, 1920, expended not less than $250 in improvements on or for the benefit of each location.

(*d*) That claimant must on or before February 25, 1921, or within six months after final denial or withdrawal of application for patent, file a relinquishment to the United States of all right, title, and interest in and to the land. This relinquishment must be in the form of an unconditional quit-claim deed, duly executed and acknowledged, but not recorded, and when filed will be held for such action as the facts and the law in the case warrant and require.

In addition to the above, the conditions outlined in paragraph (*e*) of section 20 hereof are applicable to relief in Alaska.

B. *For lease.* — The conditions necessary to obtaining a lease under section 22 of the act are identical with those outlined in the paragraphs relating to permits in Alaska together with the following additional conditions:

(*a*) That claimant or predecessors must have drilled an oil or gas well on the land to discovery.

(*b*) That claimant must pay for one-eighth of the past production exclusive of that used on the land for production purposes or unavoidably lost.

23. Alaska claims — Relief that may be granted under section 22:

(*a*) A claimant qualified under the above conditions relating to permits, upon complying with the conditions of the act and these regulations will be entitled to prospecting permits under the same terms and conditions as other permits in Alaska

provided for in section 13 of the act, substantially in the form prescribed in section 6 hereof.

(*b*) A claimant qualified under the above conditions relating to leases is entitled to a lease substantially in the form prescribed in section 17 hereof, the rental and royalty to be fixed by the Secretary of the Interior and specified in the lease, subject to readjustment at the end of each 20-year period of the lease.

(*c*) Only five permits or leases in the aggregate may be held at any one time by any claimant, and not more than 1280 acres may be included in one permit under section 22 of the act.

23½. Royalties and rentals on oil and gas leases in Alaska. — The royalties and rentals payable under oil and gas leases granted in Alaska pursuant to sections 14 and 22 of the act of February 25, 1920 (Public No. 146), are hereby determined and prescribed as follows:

(*a*) For leases granted under section 22 of the act, the royalty shall be: (1) For the first five years from and after the date of the lease, no royalty, except in the case of leases whereon the producing wells yield an average of 100 barrels or more per well per day for the calendar month, in which event the royalty shall be 5 per cent of all oil produced; (2) for the second period of five years from and after the date of each lease under section 22 of the act the royalty upon all leases shall be 5 per cent; (3) for the succeeding 10 years the royalty upon all leases under section 22 of the act shall be 10 per cent of all oil produced.

(*b*) Upon leases granted in Alaska under section 14 of the act, the permittee who discovers oil will be entitled to a lease for one-fourth of the area of the permit without payment of royalty for the first five years succeeding the date of the lease and thereafter shall pay a royalty of 5 per cent upon all oil produced. On the remaining lands included within the area of the permit, the permittee will be given a preference right to a lease without payment of royalty for the first five years succeeding the date of the lease, except in the case of leases whereon the producing wells yield an average of 100 barrels or more per well per day for the calendar month, in which event the royalty shall be 5 per cent; for the second five years, the lessee will be required to pay a royalty of 5 per cent upon all oil produced, and for the succeeding 10 years, a royalty of 10 per cent upon all oil produced.

(*c*) No royalty will be charged in any case upon leases wherein the wells upon the lands average less than 10 barrels per well per day for the calendar month.

(*d*) No rental upon any oil or gas lease in Alaska will be charged during the first five years succeeding the date of the lease. After the expiration of the first five years succeeding the date of the lease, a rental of 10 cents per acre per annum will be charged on all leases, payable in advance: *Provided*, That the rentals so paid for any one year shall be credited upon the royalties accruing for that year.

(*e*) The royalties on gas produced, if any, will be fixed and determined in each lease.

24. Beneficiaries under leases or permits. — All leases or permits under sections 18, 19, and 22 shall inure to the benefit of the claimant and all persons claiming through or under him by lease, contract, or otherwise, as their interests may appear, subject to the same limitations as to area and acreage as is provided for claimant, but such persons will not necessarily be made parties to Government leases, and may assert their rights in the courts. Disputes of this character are

not to be confused with adverse claims based upon independent title, hereinafter referred to. (See sec. 28 hereof.)

24½. WHO MAY APPLY. — All proper parties to a claim for relief under section 18, 19, or 22 of the act should join in the application, but, if for any sufficient reason that is impracticable, any person claiming a fractional or undivided interest in such claim may make application for a lease or permit, stating the nature and extent of his interest, and the reasons for nonjoinder of his co-owner or co-owners. In cases where two or more applications are made for the same claim or part of a claim, leases or permits will be granted to one or more of the claimants, as the law and facts shall warrant and as shall be deemed just.

25. FORM AND CONTENTS OF APPLICATION. — No set forms of application for a lease under section 18, 19, or 22, or a permit under section 19 or 22 of the act can be prescribed because the facts and circumstances pertaining to claims for relief are so varied. Applications for such leases or permits must be made under oath and the supporting documents and papers certified or under oath so far as practicable. The application, with all the accompanying papers, should be filed in the United States land office of the district in which the land is situated. Applications and supporting papers need not be executed in duplicate, but one complete copy of each application and supporting papers (except abstract of title) should be filed with the application, which copy will be transmitted by the register and receiver to the Chief of Field Division and notation to that effect made on the original. The application should contain full information as to the facts upon which the applicant relies for relief, covering the following points and such additional matters as may, from the peculiar facts in the case, be material in the establishment of his claim under the law:

(*a*) Date of application for lease or permit.

(*b*) Applicant's name, post-office address and citizenship.

(*c*) *Description of land.* — The land for which the application is made must be described by legal subdivisions of section, township, and range, if surveyed; if not surveyed, then by metes and bounds and courses and distances from some permanent monument. If the application is for a lease of unsurveyed land, the applicant, after he has been awarded the right to a lease, but before issuance thereof, will be required to deposit with the United States surveyor general of the State in which the land is situated the estimated cost of making a survey of the land, the balance, if any, after the survey is completed to be returned.

(*d*) *Origin and basis of applicant's claim for relief.* — The applicant must bring his claim clearly within all the requirements of the act as specifically pointed out in sections 18, 20, and 22 of these regulations. Every application must be supported by a duly certified abstract of title to the land brought up to the date of filing the application. In the event an abstract of title is already on file in the Land Department, a supplemental abstract extending over the period or periods not covered by the former may be furnished, and if furnished will be considered in connection with the abstract already on file. If any fraud has been committed in connection therewith, then a full affirmative showing must be made by the applicant to the effect that he has not been a party to such fraud, and that he has not been guilty of any fraud or had knowledge of fraud or reasonable grounds to know of any fraud in connection with his claim. If an application for patent has been filed, a brief résumé of the actions taken thereon should be stated. If the land is or has been

involved in litigation in the courts to which the United States is a party, the status or result of such litigation should be furnished.

(*e*) *Particulars as to conflicting claims or interests.* — All conflicting or disputed claims, if any, to the land or production therefrom, specifying the character and extent of such interests, must be shown.

(*f*) *Discovery.* — Before a lease may be awarded under the relief sections of the act it must be satisfactorily shown that the applicant or his predecessors have drilled a well to a substantial and certain discovery of oil or gas in a producing stratum on the land covered by the location under which the applicant is asserting his claim.

(*g*) *Wells, improvements, and production.* — With each application for a lease under section 18, 19, or 22 of the act there must be filed a complete and detailed statement showing the number, depth, condition, and present daily production of all wells drilled on the land by the applicant and his predecessors in interest, and the nature and extent of all other improvements placed thereon by them.

With each application for a premit under section 19 or 22 of the act, a description of the work performed and improvements made upon or for the benefit of the location by the applicant and his predecessors must be filed, together with an itemized statement of the cost thereof. If the application is made under section 22, the date the work was performed or the improvements made must also be shown.

In either case applicant must show the position of all wells and improvements by courses and distances from the nearest corner of the public land survey, if the land is surveyed; if not surveyed, then from a corner of the claim. This may be shown by means of a diagram.

(*h*) *Amount and value of past production.* — Claimant must furnish a complete detailed statement, by months, of all past production from the land, up to the date of filing the application and relinquishment, showing (1) the grade and total quantity of oil and gas produced; (2) the amount sold or otherwise disposed of, to whom sold, and the selling price or other consideration received therefor; (3) a statement of the grade and amount of any and all such production held in storage, when produced, and the value at time of production; and (4) the amount consumed for production purposes on the land, or unavoidably lost.

Copies of any and all contracts under which oil or gas produced from the land has been or is being sold or otherwise disposed of must be furnished.

(*i*) *Inspection of records.* — The agreement on the part of the applicant to permit the inspection of any and all books, records, and accounts having any bearing on the data or information required by the application and to furnish copies or abstracts of such books, records, or accounts, on demand.

(*j*) *Interest in other leases and permits.* — The applicant will also furnish a complete statement of all lands for which he has filed application for lease or permit under sections 18, 19, and 22 of the act, and of such lands as are included in other applications in which he has any direct or indirect interest, together with a full disclosure of such interest by stock ownership or otherwise. If the applicant is a corporation, a certified copy of its articles of incorporation must be furnished, and a full disclosure made of the ownership of its stock, whether such stock is owned, held, or controlled directly or indirectly by any other person or corporation, who or which is an applicant for or a holder of a lease under said sections, and, in the event of such ownership, a description of the legal subdivisions of all the lands affected there-

by is required. Lists of stockholders need not necessarily be filed in the local land offices, but may be filed directly with the Commissioner of the General Land Office, where they will be kept confidential except for Government purposes. In the event the lands so affected are not surveyed they may be described by the usual method of courses and distances and acreage.

(*k*) *Limitation of area.* — Applications for lease under section 18 of the act should disclose all other applications in which the applicant is directly or indirectly interested, for lease under said section for lands (describing same) in the same geologic structure; and applications under section 22 of the act should show all other applications for leases or permits under said section. The boundaries of the geologic structures of the various producing fields will be determined and announced by the United States Geological Survey under supervision of the Secretary of the Interior, and such information will be placed on file in all United States land offices.

(*l*) *Interests of beneficiaries.* — In applications for lease the nature and extent of the interests of all beneficiaries thereof by virtue of operating contracts or otherwise, not covered by paragraph 25 (*j*), must be disclosed, together with a full showing of all their interests in other leases or applications for leases under this act. If the beneficiary is a corporation or joint-stock company, a full disclosure must be made of the ownership of its stock and the residence and citizenship of its stockholders.

26. Payment of royalty on past production. — The application must be accompanied by a certified check in the amount of one-eighth of the gross value of all oil and gas produced and sold or held in storage, as per the statement required in paragraph 25 (*h*). All such sums will be held by the receiver in his account of "Trust funds — Unearned moneys" to await instructions as to their disposition. In lieu of the certified check herein required, the applicant may be permitted to deposit a bond by approved surety company in an amount not less than one-eighth of the estimated gross value of all oil and gas produced and sold or held in storage, securing the payment to the United States within 30 days from the award of the lease of the cash value of the past production due the United States under this act. In cases where the proceeds, or part thereof, of such past production have been deposited in escrow, pursuant to operating agreements under the act of August 25, 1914 (38 Stat., 708), or where in suits brought by the Government affecting such lands the proceeds of production, or part thereof, have been impounded in the custody of receivers, a formal tender may be made of the funds so held in escrow or impounded to the extent available or in the amount necessary, as the case may be, in lieu of such cash payment. In such cases the interest accumulating on such escrowed or impounded moneys after the tender is made will go to the Government.

Liberty bonds will be accepted at original cost in payment of royalty on past production in such proportion as the escrowed or impounded moneys have been invested therein.

Operating contracts made under the provisions of the act of August 25, 1914, supra, and in operation at the time of such tender, will not be terminated until the entire transaction of granting a lease and payment of royalty on past production shall have been consummated; nor will the Department of Justice be requested to dismiss any suits involving the land affected until the application for a lease has been adjudicated and approved; whereupon, after the suit has been dismissed and the impounded money tendered paid over to the Government, the lease will be executed and delivered.

27. Publication of notice. — Immediately upon the filing of an application for a lease or permit under section 18, 19, or 22 of the act, the register and receiver will cause to be published, at the expense of the applicant, in a newspaper designated by the register, published in the vicinity of the land and most likely to give notice to the general public, a notice of the said application in substantially the following form:

Department of the Interior
United States Land Office

———— ————, 19—.

Notice is hereby given that ———— ————, of ————, has applied for an oil and gas ———— under section ———— of the act of February 25, 1920 (Public No. 146), for ———— section ————, township ———— of range ————, ———— meridian, ———— county, State of ————, Any and all persons having adverse or conflicting claims to said land are hereby notified that a full statement, under oath, of such claim should be filed in this office showing a superior right to a permit or lease under said act or a valid existing adverse or conflicting claim to the land or the minerals therein under the public-land laws, on or before ————; otherwise such claim may be disregarded in granting the permit or lease applied for.

———— ————,
Register.

The register and receiver will fix a date in the notice on or before which adverse or conflicting claims may be asserted, which date should be not less than 30 nor more than 40 days after the date of first publication of the notice.

Such notice will be published in the regular issue and not in any supplement of the newspaper, once each week for a period of five consecutive weeks if in a weekly paper, or if in a daily paper for a period of 30 days. The register and receiver will post a copy of said notice in a conspicuous place in their office during the period of publication.

Upon the applicant's furnishing satisfactory proof of such publication, but not earlier than the day following that set in the published notice on or before which adverse or conflicting claims were to be filed, the register and receiver will transmit by special letter all papers in the case, including any adverse or conflicting claims that may have been filed, together with proof of posting said notice in their office, to the Commissioner of the General Land Office.

28. Adverse or conflicting claims — Procedure. — In case of adverse or conflicting claims for leases under section 18, 19, or 22, or permits under section 19 or 22, the Secretary of the Interior is clothed with authority to grant leases or permits, as the case may be, to one or more of them, as shall be deemed just.

(*a*) To have their claims considered in connection with the awarding of leases or permits it will be necessary for adverse claimants to make full showing (1) of a superior right to a lease or permit under this act, or (2) a superior right under some other public-land law. If the former, the conflicting claimant must make out a complete case in his own behalf as required by these regulations on or before August 25, 1920.

(*b*) Upon receipt of the application and showing of an adverse claimant the

Commissioner of the General Land Office will consider same. If, in his judgment, the adverse claimant has failed to make a prima facie case showing that he is entitled to a lease or permit, as the case may be, for at least part of the land, his application will be rejected, subject to appeal to the Secretary of the Interior. But if the adverse claimant makes out a prima facie case the commissioner will take such course as may be advisable under the circumstances of each particular case to settle and adjust the rights or the respective parties, and may, if deemed necessary, order a formal hearing to settle disputed questions of fact. In the absence of appeal to the Secretary of the Interior from the final order or decision of the Commissioner same shall be conclusive.

29. Compromises under section 18a. — No special procedure will be outlined under this section. Any request for a compromise or settlement under this section which may be filed in the Land Department will be transmitted to the President with such report as may be deemed advisable under the circumstances of the particular case. In case the land is in a naval petroleum reserve the Navy Department will be consulted before making such report.

IV. — RIGHTS OF WAY FOR PIPE LINES

30. Section 28 of the act grants to any applicant having the qualifications outlined in section 1 of these regulations rights of way through public lands of the United States, including national forests, for pipe-line purposes for the transportation of oil or natural gas, on condition that the pipe lines for which rights of way are granted shall be operated and maintained as common carriers. The grant carries with it the right to the use of the ground actually occupied by the pipe line, and 25 feet on each side thereof for the purpose of construction, maintenance, and operation of the pipe line. Applicants for rights of way under this act will be governed by the regulations set forth in circular of June 6, 1908 (36 L. D., 567), in so far as applicable, appropriate changes being made in the forms therein prescribed to make them applicable to right-of-way cases arising under the act of February 25, 1920 (public No. 146), for pipe lines to be constructed, maintained, and operated as common carriers. Failure on the part of grantee to fulfill the conditions imposed by the act shall be ground for forfeiture of the grant by the United States district court for the district in which the property, or some part thereof, is situated.

V. — FEES AND COMMISSIONS

31. Under the authority of section 38 of the act, the following fees and commissions are prescribed for transactions under the act:

(*a*) For receiving and acting on each application for a permit, lease, or other right filed in the district land office in accordance with these regulations, there shall be paid a fee of $2 for each 160 acres, or fraction thereof, in such application, but such fee in no case to be less than $10, the same to be paid by the applicant and considered as earned when paid, and to be credited in equal parts on the compensation of the register and receiver within the limitations provided by law.

(*b*) A commission of 1 per cent on all moneys received in each receiver's office, to be equally divided between the register and receiver; such commission will not be collected from the applicant, lessee, or permittee in addition to the moneys otherwise provided to be paid.

It should be understood that the commission here provided for will not affect the disposition of the proceeds arising from operations under the act as provided in section 35 thereof; also that such commission will be credited on compensation of registers and receivers only to the extent of the limitation provided by law for maximum compensation of such officers.

VI. — REPEALING AND SAVING CLAUSES

32. Section 37 of the act provides that hereafter the deposits of coal, phosphate, sodium, oil, oil shale, and gas, referred to and described therein, may be disposed of only in the manner provided in the act "except as to valid claims existent at date of passage of this act, and thereafter maintained in compliance with the laws under which initiated, which claims may be perfected under such laws, including discovery.

Stated negatively under this section of the act the following classes of oil or gas placer locations, so called, notwithstanding absence of fraud and full compliance with law in other respects, may not proceed to patent, viz:

(*a*) Any location made after withdrawal of the land.

(*b*) Any location made before withdrawal of the land, but not perfected by discovery at date of withdrawal, which does not come within the protective proviso of section 2 of the act of June 25, 1910 (36 Stat., 847); that is to say, any claimant who, at date of withdrawal, was not a bona fide occupant or claimant in diligent prosecution of work leading to discovery of oil or gas, and who has not continued in such diligent prosecution to discovery.

(*c*) Any location on lands not withdrawn, on which, at the date of the act, the claimant had not made discovery or was not in diligent prosecution of work leading to discovery, and does not continue such work with diligence to discovery.

CLAY TALLMAN
Commissioner.

Approved:
JOHN BARTON PAYNE,
Secretary.

DIGEST OF DECISIONS AND OPINIONS IN CONNECTION WITH THE ADMINISTRATION OF THE ACT OF FEBRUARY 25, 1920, AS APPLIED TO OIL AND GAS

Permits for lands in Government reclamation projects.

In the case of permits issued for lands within reclamation withdrawals the following additional conditions will be included in the permit:

7. (*b*) To reimburse damage sustained by any reclamation homestead entryman pursuant to the requirements of paragraph 8 hereof: (*c*) To pay any damage caused to any reclamation project or the water supply thereof by failure to comply fully with the requirements of paragraph 9 hereof.

8. That as to any lands covered by this permit which are also embraced in any reclamation homestead entry with a reservation of the oil and gas to the United States, permittee shall reimburse the entryman for all damage to crops or improvements caused by such drilling or other operations, such damage to include reimbursement of the entryman by the permittee of all reclamation charges for construction, operation, and maintenance for the portion of the land used and occupied by the permittee during the period of such use and occupation.

9. That as to any lands covered by this permit within the area of any Government reclamation project or in proximity thereto the permittee shall erect such dikes and embankments or take such other precautions as may be necessary, as required by the project manager, effectively to impound any flow of refuse oil, salt water, or oil from wells drilled, to prevent any injury to lands susceptible of irrigation under such project or injury to the water supply thereof.

In such case the following form of bond will be required:

DEPARTMENT OF THE INTERIOR
GENERAL LAND OFFICE

U. S. Land Office ———.
Serial number ———.

Bond of oil and gas permittee.

[Act of Feb. 25, 1920 (Public No. 146).]

Know all men by these presents, That ——— ——— of ——— State of ——— as principal, and ——— ——— of ——— State of ———, as surety, are held and firmly bound unto the United States of America, for the use and benefit of the United States and of any reclamation homestead entryman on any of the hereinafter described lands embraced in that certain prospecting permit hereinafter referred to, in the sum of $5000, lawful money of the United States, for which payment, well and truly to be made, we bind ourselves, and each of us, and each of our heirs, executors, administrators successors, and assigns jointly and severally by these presents.

Signed with our hands and sealed with our seals this ——— day of ———, 19—.

The condition of the foregoing obligation is such that, whereas the said principal has been granted under the act of February 25, 1920, Public No. 146, a permit (Serial No. ——) to prospect for oil and gas for two years, upon the following described lands: ———————————————————————————, on condition that the permittee shall (*a*) repair promptly, so far as possible, any damage to the oil strata or deposits resulting from improper methods of operation; (*b*) reimburse any homestead entryman of land covered by said permit for all damage to crops and improvements caused by drilling or other operation by the permittee, such damage to include reimbursement of the entryman by the permittee of all reclamation charges for construction, operation and maintenance for the portion of the land used and occupied by the permittee during the period of such use and occupation by the permittee; and (*c*) erect such dikes and embankments or take such other precautions as may be necessary, as required by the project manager, effectively to impound any flow of refuse oil, salt water, or oil from wells drilled, to prevent any injury to lands susceptible of irrigation under any government irrigation project or injury to the water supply thereof.

Now, therefore, if said principal shall promptly and in all respects comply with said conditions, then the above obligation shall be void and of no effect; otherwise and in default of full and complete compliance therewith the said obligations shall remain in full force and effect.

Signed, sealed and delivered in the presence of:

(Name and address of witnesses.)

——— ———

——— ———

——— ———. [L. S.]
Principal.

——— ———

——— ———

——— ———. [L. S.]
Surety.

Permits for deposits reserved under act of July 17, 1914 (38 Stat., 509).

In the case of permits issued for deposits of oil or gas reserved to the United States under the provisions of the act of July 17, 1914 (38 Stat., 509), the following additional condition will be included in paragraph 7 thereof:

(*b*) To reimburse any entryman or owner of any portion of said lands heretofore entered with a reservation of the oil and gas deposits to the United States made pursuant to the act of July 17, 1914 (38 Stat., 509), for any damage to the crops and improvements of such entryman or owner resulting from drilling or other prospecting operations.

In such case the following form of bond will be required:

DEPARTMENT OF THE INTERIOR
GENERAL LAND OFFICE

U. S. Land Office ———.
Serial number ———

Bond of oil and gas permittee.

[Act of Feb. 25, 1920, Public No. 146.]

Know all men by these presents, That ——— ———, of ———, State of ——— as principal, and ——— ———, of ———, State of ———, as surety, are held and

firmly bound unto the United States of America, for the use and benefit of the United States, and of any entryman or owner of any of the hereinafter described lands embraced in that certain prospecting permit hereinafter referred to, in the sum of $1000 lawful money of the United States, for which payment, well and truly to be made, we bind ourselves, and each of us, and each of our heirs, executors, administrators, successors, and assigns, jointly and severally by these presents.

Signed with our hands and sealed with our seals this ——— day of ———, 19—.

The condition of the foregoing obligation is such that, whereas the said principal has been granted under the act of February 25, 1920, Public No. 146, a permit (Serial number ———) to prospect for oil and gas for two years upon the following lands: ——————— on condition that the permittee shall (*a*) repair promptly, so far as possible, any damage to the oil strata or deposits resulting from improper methods of operation; (*b*) reimburse any entryman or owner of any portion of said lands heretofore entered with a reservation of the oil and gas deposits to the United States made pursuant to the act of July 17, 1914 (38 Stat., 509), for any damage to the crops and improvements of such entryman or owner resulting from drilling or other prospecting operations.

Now, therefore, if said principal shall promptly and in all respects comply with said conditions, then the above obligation shall be void and of no effect; otherwise and in default of full and complete compliance therewith the said obligations shall remain in full force and effect.

Signed, sealed, and delivered in the presence of:

(Name and address of witness.)

——— ——— ——————— [L. S.]
Principal.

——————————

——— ——— ——————— [L. S.]
Surety.

——————————

Attorneys in fact.

In making applications for lease or permit corporations may act by attorneys in fact. Individuals and associations of individuals should execute their own papers.

Limitation of holdings.

A corporation (except under the relief sections) may not have an interest in more than three leases, either directly as a lessee, or indirectly as a stockholder in a corporate lessee. An individual may hold stock in any number of corporations holding leases provided his stock interests do not represent a greater acreage than 2560 in the same producing structure, or 7680 acres in the same State.

Alien ownership.

Aliens may not have any direct holding of lease under the oil-leasing act, but may be stockholders in American corporations holding leases, provided the laws of their country do not deny like privilege to American citizens. American corporations, some of whose stock is owned by aliens, may make application for lease with a full disclosure of the residence and citizenship of its stockholders, and the department will then determine whether a lease may be granted.

Conflicting preference rights under sections 19 and 20.

The preference right attaches to the claim first initiated and legally maintained. A locator of a mining claim who has complied with all the provisions of section 19

of the act will be entitled to a preference right over a homestead entryman whose entry was made after the location, the homesteader, however, being entitled to hold the surface right. If the homestead entry was made prior to the date of the placer location, the homestead claimant will have the superior right, except in the case of a stock-raising homestead, wherein all minerals are reserved to the United States.

Permit for unwithdrawn land covered by agricultural entry.

No permit will be granted until entryman has elected to take patent with reservation of oil and gas to the United States. If such a waiver is filed, entryman may then exercise his preference right, if any, to permit for lands covered by such entry.

Preference rights under section 20.

Preference rights under section 20 exists in cases where entry was made prior to February 25, 1920, for unwithdrawn or unclassified lands, without any reservation of the minerals by the United States, and thereafter the claimant files a waiver of his right under the entry to the oil or gas. No preference right exists where land is covered by stock-raising entry, nor where entry is made subject to the act of July 17, 1914, with oil and gas reservations.

Assignability of permits.

Assignment of a mere right to a permit will not be recognized, but after permit is granted it may be assigned upon consent of the Secretary of the Interior first hand and obtained.

Incontiguous tracts.

Incontiguous tracts within a limited radius may be included in a permit where conditions are such that, because of prior disposals, a reasonable area of contiguous land can not be procured.

Pending application for permit, land designated as oil structure.

Where after application under section 13 for a permit and before permit is granted the land is designated as within the structure of a producing oil or gas field, permit can not be allowed.

Preference right under section 20.

A permit to prospect will be granted an applicant entitled thereto under section 20 of the act, notwithstanding the land is part of a producing oil structure, but only one permit may be granted in the same structure to the same applicant.

Carey Act segregation as affected by leasing law.

The lands in a Carey Act segregation come under the provisions of section 2 of the oil and gas regulations, and permits and leases may be granted for such lands, subject to such stipulations and requirements as the Government may impose for the protection of the reclamation project, to the end that the best development of the lands, both for mineral and agricultural purposes, may be accomplished.

Neither the State nor its contractor would be entitled to any preference right under section 20 of the act, and whether a Carey Act entryman would have such a right would depend upon the conditions affecting his entry being such as to bring him within the provisions of section 20.

Office practice — Conflicting applications.

The issuance of a permit should be deferred, where all is regular and the applicant appears entitled to the permit, until the conflicting applicants have been notified that their applications have been rejected, because subsequent in time, subject to the right to show cause or to appeal within 15 days from receipt of notice.

Posting notice by agent.

Under the law, the action of an agent in posting notice is the action of his principal, but the application for permit may not be executed by agent, unless applicant is a corporation.

Permits of corporations as affected by stockholders' permits.

The maximum number of permits to a corporation under section 13 of the act is not limited by permits of individual stockholders, but a corporation may not have an interest in more than three permits in same State, nor in more than one in the same geologic structure, directly or indirectly. An individual may hold a direct interest in not more than three permits and his total interest as permittee and stockholder may not exceed an aggregate of 7680 acres in the same State, or 2560 acres in the same geologic structure.

Preference right permits to qualified assignees.

Section 19 of the act of February 25, 1920, is construed to permit qualified assignees since October 1, 1919, to secure preference right permits, but no such transferee will be permitted to hold permits exceeding 2560 acres for such lands in the same geologic structure, nor more than three times that area in the same State.

Permits in Alaska.

The same rule applies in Alaska as in the States; that is, not more than one permit in same structure.

Rights under " paper locations."

Arguments have been presented in favor of a construction of section 37 of the leasing act, that would have the result of validating so-called " paper locations " of placer mining claims, and assuring the ultimate right to absolute patent to such claims in case of discovery. Such locations consist merely of setting stakes to indicate the boundaries, posting a notice, and perhaps filing that notice in a proper recording office. It is understood that practically all the public domain having known possible prospective value for oil, is covered by such locations. It is not believed that Congress had any such intention or that the language of the act justifies any such conclusion.

Under the express requirements of the mining laws and the decisions of the courts covering a long period of years, *discovery of mineral* has been the sole basis for the location of a mining claim. Without such discovery, the mere posting of notices and marking the boundaries creates no right whatever.

The mining law gives the right to any citizen to explore the public domain for the purpose of finding mineral; hence, the courts have protected a citizen in actual, physical possession of a prospective claim on the public domain, while he is engaged in diligent prosecution of work leading to the discovery of mineral, but this is as far as the courts have gone. As applied to oil lands, this rule was well stated by the Supreme Court of California, in the case of McLemore *v.* Express Oil Company (158 Calif., 559), in the following language:

But where the location is incomplete no question of assessment work is involved. What the attempting locator has is the right to continue in possession, undisturbed by any form of hostile or clandestine entry, while he is diligently prosecuting his work to a discovery. This diligent prosecution of the work of discovery does not mean the doing of assessment work. It does not mean any attempted holding, by cabin, lumber pile, or unused derrick. It means the diligent, continuous prosecution

of the work, with the expenditure of whatever money may be necessary to the end in view.

These propositions of law were reiterated by the United States Supreme Court as recently as March 15, 1920, in the case of Cole *v.* Ralph.

From the foregoing it will be seen that no rights whatever could be obtained by mere staking and posting unless such act was followed up with diligent and continuous work leading to discovery. Section 37 of the new leasing act excepts from the operation of that act "valid claims existent at date of passage of this act and thereafter maintained in compliance with the laws under which initiated, which claims may be perfected under such laws, including discovery." Obviously a *valid* claim under the former law is one that the courts and the Land Department will protect and respect as against the claims of others. The mere staking and posting of notices do not constitute such a claim, and the regulations so hold.

Any other view as to the construction of section 37 is inconsistent with the provisions of other sections of the leasing law. Section 19 provided for relief, so-called, for those persons who initiated claims on the public domain at a time when the lands were not withdrawn or classified, and who, at the date of the act, had not perfected such claims by discovery, and if further provides that where such a claimant had expended an amount equal in the aggregate to $250 toward the development of his claim, such claimant, if in good faith and the claim was initiated prior to October 1, 1919, would be entitled to a prospector's permit for the area embraced in his claim.

The provisions of the relief sections (18, 18*a*, 19, and 22), were the subject of extended consideration by the committees of Congress, and it is clear that the provisions of section 19 are just as far as Congress intended to go in the protection of claims and locations of the class here under discussion. To construe the act as validating mere "paper locations" would be placing Congress and this department in the position of saying that one who had expended $250 on his claim would be entitled only to a prospecting permit, while one who had only a stake and notice would be left with the privilege for an indefinite time of ultimately getting absolute title. It is further argued that under the act claimant has the option of taking a relief permit under section 19 or standing on his "paper location" under section 37. One might as logically argue that claims for relief under section 18, over which there has been so much controversy, may now go to absolute patent by virtue of section 37. Congress never contemplated any such anomalous situation.

If the view urged in these arguments were adopted there would be little use for a leasing act for oil lands outside the withdrawn areas, and perhaps for lands within such areas. The purpose and policy sought to be accomplished by this important legislation would be largely negatived, and the States and the Reclamation Service would be deprived of funds they are counting on for development purposes. Moreover, there is no practical necessity for the construction urged to protect any legitimate interest. The new law is liberal in the extreme in giving all good-faith claimants, who have made any material expenditures on the ground, fair and reasonable opportunity to transmute such claims into permits and leases under the new law under far more practical working conditions than existed under the former laws.

Oil-land leases — Stock-raising homesteads.

The question has arisen as to whether or not the provisions of section 20 of the leasing act are applicable to lands covered by stock-raising homestead entries.

Section 20 is one of the so-called relief sections of the law, all of which sections are based upon alleged equities of the persons to whom a preference right to a permit or lease is accorded. It was designed to recognize the equities of persons who had gone upon the public domain and made homestead entries under the 160 or 320 acre homestead law, neither of which contains any reservation of minerals, upon the theory and under the belief that they were obtaining an unrestricted title to the land. Because of a *subsequent* withdrawal or classification of the land as mineral after the allowance of their entries, and after they had spent their time and money upon the land, they were under the necessity of either losing the land entirely or accepting a patent under the provisions of the act of July 17, 1914, reserving the oil and gas deposits in the land to the United States. No such equity or reason exists in the case of entries under the 160 or 320 acre homestead law made upon lands *theretofore* withdrawn or classified as mineral, because the entryman knew at the time he made the entry that the mineral was known and reserved to the United States, and the most he could obtain was a patent expressly excluding the oil and gas deposits. This is true of all stock-raising homestead entries; for by the terms of the act itself all minerals within the land are expressly reserved to the United States, together with the right to enter upon the lands, mine and remove the same.

Lands within stock-raising homestead entries need not be withdrawn or classified for the purpose of preventing disposition of minerals under the agricultural land laws, because the minerals are reserved in the law itself. It is, therefore, clear that Congress, when it used in section 20 of the leasing act, the words " lands bona fide entered as agricultural and not withdrawn or classified as mineral at the time of entry," had in mind only the entries under the 160 or 320 acre homestead law, which contains no reservation or classification of mineral, and where *subsequently*, by reason of a withdrawal or classification, the entryman was, as stated above, under the necessity of accepting a restricted patent. Any other construction of the statute would involve the disregarding of the language " and not withdrawn or classified as mineral at the time of entry."

The regulations specifically state that the preference right under section 20 of the act exists only where the land was entered prior to withdrawal or classification, and *subsequent* to entry was withdrawn or classified as oil or gas bearing in character. This clearly could have no application to entries under the stock-raising homestead law, where all minerals are reserved and where no withdrawal or classification is necessary.

Preferential rights of agricultural claimants.

Whatever preferential rights homesteaders or other agricultural entrymen as such may have to oil permits or leases must be found in section 20 of the act. While this section is not as clear and specific in some respects as might be desired, it is apparent that the class of entrymen or patentees on which Congress intended by this section to confer a preference right is those who made their entries when the land was *not withdrawn or classified* as mineral, and who were therefore permitted to make their entries without any reservation of the mineral to the Government, but were or will be compelled to take a patent with the reservation because of a withdrawal or classification of the land, or because in the meantime the land has

become of known mineral character, before submission of final proof. It is also apparent that this section is in the nature of a relief provision, designed to take care of those who found themselves in the situation above described at the time the act was passed, and not intended to provide generally for the disposition of mineral rights under the homestead law in the future.

With these general propositions in mind, the following specific statements may be made:

1. If the land was withdrawn or classified *at the time of entry* so that the entry was made with a reservation of the mineral, there is no preference right. Conversely, to entitle the homesteader to a preference right the entry must have been properly made *without a reservation* of the mineral.

2. There can be no preference right on an entry allowed after February 25, 1920. See section 12 of the regulations.

3. There can be no preference right on a stock-raising entry under the act of December 29, 1916, for under that act all entries are made with a reservation of the mineral.

4. If the homestead entry was made without reservation of the mineral, but after the lands were of known mineral character, and for the purpose of acquiring mineral rights, there is no preference right to a permit because (*a*) such an entry should have been made with a reservation of the mineral and the requisite non-mineral affidavit on which the entry was procured was fraudulent, and (*b*) the entry is not " of lands bona fide entered as agricultural."

5. But where one has an original entry under the 160 or 320 acre law and an additional entry under the stock-raising (640-acre) law, the entryman will have the same rights under the original as he would have had had he not made the additional.

6. Where one has an entry without a reservation of the mineral, nobody (not even the entryman himself) may acquire a permit or lease for the mineral so long as the entry stands in that shape.

7. But if the entryman in the case last above mentioned files a waiver of the mineral rights in the land, then he may exercise his preference right, if he has any, and if not, others may file application for a mineral permit or lease.

8. The " reservation " of the mineral above referred to is pursuant to section 2 of the act of July 17, 1914 (38 Stat., 509), which provides that the mineral occupant shall pay any damage caused to the agricultural claimant.

9. Where a patented entry, or one on which final certificate has issued, has been sold or transferred, the transferee would have the same rights as the entryman, provided he acquired the land before January 1, 1918, but if he acquired it after that date, there would be no preference right in anybody.

10. A patentee, or entryman with final certificate, with a reservation of the mineral to the Government, who has a preference right can not withhold the land from development indefinitely. Section 12 of the regulations provides that if anybody else applies for a permit on the land, the preference-right man shall be given notice and allowed 30 days within which to exercise his preference and apply for a permit himself; otherwise he will be out.

11. The preference-right claimant must be qualified to take a permit under the law the same as anybody else; for instance, an alien transferee of patented land could not get a permit or lease; one who has already received the limit of permits allowed could not get a permit.

12. The matter of whether the agricultural entry on which a preference right to a permit is predicated is within or without a known producing structure cuts no figure in connection with the preference rights here under consideration, provided that only one permit may be granted to the same structure.

13. In case of conflict between a preference-right claimant under sections 18 and 19 and one under section 20 the one would prevail whose rights were prior in their lawful inception.

Conflicts between nonmineral claims and oil placers.

When an otherwise valid oil placer location is perfected by discovery the land is not subject to other appropriation so long as the mining claim is maintained, and should it be entered or applied for under some other law prior to the filing of an application for patent by the mining claimant the burden of protecting his claim by contest will rest upon him. This is necessarily so, as the land is not segregated from record entry by a mere mining location of which the land department has no record.

An oil placer location, perfected by discovery, laid over land embraced in a prior, valid, subsisting homestead entry, is ineffective so long as the homestead stands. (Prior to the act of July 17, 1914, the mineral claimant could contest the homestead and cause its cancellation; under that act the homesteader may retain surface rights and the mineral is automatically withdrawn; and under the leasing act the homesteader might have a preference right to a permit for the mineral.) A stock-raising homestead is an exception to this rule, for all minerals are reserved therefrom, and the oil deposits could have been located under the placer law up to February 25, 1920.

A mere " paper " oil placer location (that is, one without a discovery) will not prevent a homestead entry for the land, but where the claimant of a " paper location" is on the ground in diligent prosecution of work leading to discovery at the time the land is homesteaded, he may by contest defeat the homestead entry.

The allowance (after Feb. 25, 1920) of a homestead entry on land covered by valid rights to relief permits or leases under sections 18 or 19, is entirely within the discretion of the Secretary of the Interior.

Reservation of mineral — When required.

Where a homestead entry (not under the grazing act) is made without a reservation of the oil to the Government and the land is withdrawn or classified as oil land before completed final proof is submitted, the entryman must take patent with a reservation of the oil, unless he can procure a reclassification of the land by the department or a removal of the withdrawal, or unless he can show at a hearing (the burden of proof being on him) that the land was not of a known mineral character at date of final proof.

But where, in the case last stated, the withdrawal or classification as mineral was not made until after final proof was submitted, the entryman will be entitled to a patent without a reservation, unless the Government can show (the burden of proof being on the Government), at a hearing if necessary, that the land was of known mineral character at the date of final proof. If the Government can show this, the result will be the same regardless of whether there has been a withdrawal or classification.

Interests under drilling contracts.

A drilling contract carrying with it a right in the proceeds, or in the land itself, will be considered an interest in the lease, and when it comes time to grant a lease such drilling contractor will have to show himself qualified to take a lease. In all

cases where the drilling is performed under contract the nature and terms of the contract must be disclosed before lease is granted.

As to permits, the situation is different. If a contractor desires to be recognized by the department in connection with a permit, it will be necessary for him to file his contract for approval; but if he so desires he may explore the land under contract with the permittee and bring his contract to the attention of the department only when and if he wishes to be recognized as being interested in such lease as may be applied for.

Discovery on adjoining claims.

In case of two claims that adjoin, it is necessary to have discovery on each claim to secure lease for both under section 18. If the discovery is only on one claim, the lease must be confined to the limits of the claim containing the discovery.

Right of assignees to a lease under section 18.

Good faith locators or their grantees, whose right to a lease is governed by the provisions of section 18 of the act, may transfer their interests to contractors, assignees, or lessees who were in undisputed possession prior to July 1, 1919; and such owners may then jointly apply for a lease for their aggregate holdings or they may make a division of the area and each seek a separate lease for his individual holdings.

Discovery applicable to all parts of location.

A discovery on any part of a placer claim used as a basis for relief under section 18, 19, or 22 of the act will be deemed applicable to every part thereof for leasing purposes.

Only citizens may obtain permits or leases.

The oil and gas leasing bill provides for the issuance of prospecting permits and leases to citizens of the United States, associations of such citizens, corporations organized under the laws of the United States or of any State or Territory thereof, or municipalities. It follows from this that no one but a citizen can obtain a lease or permit, but aliens may be stockholders in some cases.

Citizenship of agent immaterial.

A notice of a prospecting permit may be posted by an agent or attorney in fact in the name of his principal. The citizenship of such agent is immaterial.

Oil claims antedating leasing act.

Oil placer claims for unwithdrawn and unclassified lands upon which discovery was made prior to the enactment of the mineral leasing law are not, in the absence of fraud, affected thereby so long as the claimant complies with the law. If discovery was not made, the claimant in order to protect his right to a patent, must have been engaged in diligent work leading to a discovery at the date of the act and must be able to show that he has continued such work to discovery.

Preference right of State grantee.

To entitle the grantee of a State to a preference right under section 20 of the mineral leasing law, the selection must have been approved and transferred by the State prior to January 1, 1918.

When the mineral leasing act took effect.

Under the general rule of law applicable to such cases, the act of February 25, 1920, was in force and operation during that entire day, subject, however, to the privilege of any person having a substantial right which would be affected by the application of the general rule to prove, if he can, the exact time of approval.

The act of February 25, 1920, supra, section 13, authorizes the Secretary of the

Interior, under such rules as he may prescribe, to grant to qualified persons a prospecting permit "upon not to exceed 2560 acres of land," and allows would-be applicants to initiate a preference right, good for 30 days, by posting notice upon the ground. This statute and the rules and regulations promulgated thereunder do not, however, confer upon such locators a right to obtain a prospecting permit for the entire acreage described in any notice of location. The statute simply fixes the maximum amount which may be embraced in a single permit, 2560 acres.

Paragraph 2 of the regulations approved March 11, 1920, states that the granting of such a permit " is discretionary with the Secretary of the Interior, and any application may be granted or denied, either in part or its entirety, as the facts may be deemed to warrant."

Subject to the foregoing, the following rule is announced for the guidance of the officers of the Interior Department and of parties in interest in the disposition of conflicts and controversies arising out of locations and applications made or filed during the day of February 25, 1920:

All locations made or applications filed, pursuant to section 13 of the act of February 25, 1920, at any time during the day of February 25, 1920, will be held, treated, and regarded as simultaneous, and in case of conflict of location and application, in whole or in part, between two or more qualified applicants, all such applicants will be allowed 30 days from notice within which to compromise their differences by division of lands or otherwise, in default of which this department will make such division or disposition as the facts may warrant.

Limitations under section 27.

It will be noted that section 27 seems to apply to two classes of interests, namely, those held directly from the Government and those held indirectly through ownership of stock in corporations. As to leases held directly, there does not seem to be much doubt that the same person or corporation may not at the same time have more than three leases in any one State, or more than one lease within the geologic structure of the same producing oil or gas field.

The section further provides that " no corporation shall hold any interest as a stockholder of another corporation in more than such number of leases." This language, taken in conjunction with the language preceding it, seems to hold that a *corporation* may not have an interest in more than three leases, either directly as a lessee, or indirectly as a stockholder in a corporate lessee. True, the next clause provides that " no person *or corporation* shall take or hold any interest or interests as a member of an association or associations, or as a stockholder of a corporation or corporations," in which the aggregate leasehold interests exceed an amount equivalent to the maximum number of acres allowed to one lessee. It is clear that as to a corporation the clause last quoted is inconsistent with the clause first quoted, and as the clause first quoted is more restrictive as to a corporation than the following clause, it is considered that the former controls. But this leaves an individual with the right to hold three leases directly, and, at the same time, to have a stock interest in corporations having leases, provided his direct and indirect holdings do not exceed the maximum for one person, namely, not exceeding 2560 acres in the same structure or 7680 in the same State. It follows also that a person may hold stock in any number of corporations holding leases provided his stock interests do not represent a greater acreage than that above stated.

While under the regulations substantially the same restrictions apply to permits

as apply to leases, the number of leases one has will not necessarily limit the number of permits he may have, but when a permit ripens into a lease, then the restrictions as to leases apply to both.

Bond with preference right application.

In the case of a preference right application under section 19, the bond may be filed therewith, or deferred until permit is authorized.

Articles of incorporation.

Under section 25 of the regulations, a certified copy of the articles of incorporation should be filed with the original application, but an uncertified copy is sufficient to accompany the duplicate.

Rights of association in geologic structure.

An association may hold only one permit in the same geologic structure, and the interest of a member of different associations may aggregate 2560 acres in the same structure.

Ceded Ute Indian lands subject to leasing act.

By departmental decision of August 8, 1920, it was held that the oil and gas deposits contained in that portion of the Ute Indian Reservation in the State of Colorado formerly occupied by the Uncompahgre and White River Utes, ceded to the United States by the confederated bands of Ute Indians by the treaty of March 2, 1868, as amended, accepted, and ratified by the act of June 15, 1880 (21 Stat., 199), and opened to disposal under the provisions of the act of July 28, 1882 (22 Stat., 178), are subject to disposal under the mineral leasing act.

Uintah ceded Indian lands subject to leasing act.

The Uintah Indian lands opened to sale and entry by act of May 27, 1902 (32 Stat., 263), are subject to the operation of the leasing act of February 25, 1920.

Procedure in relation to agricultural claims in conflict with permits or leases, or subject to preferential rights.

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
Washington, October 6, 1920.

Registers and Receivers,
United States Land Offices.

GENTLEMEN: Instructions have been requested from several local offices as to the proper procedure to take in connection with nonmineral applications or selections filed for lands embraced in applications for prospecting permits or leases, or which may be subject to preference rights, under the leasing act of February 25, 1920.

A prospecting permit is granted in contemplation of a future lease for a part or all of the same land in case of discovery; hence as to subsequent nonmineral entries, with a reservation of the oil or gas to the United States, the lands embraced in a prospecting permit should be treated the same as if embraced in an oil or gas lease, with a reservation to the United States of the right " to lease, sell, or otherwise dispose of the surface of the lands embraced within such lease under existing law or laws hereafter enacted, in so far as said surface is not necessary for the use of the lessee in extracting or removing the deposits therein,"pursuant to section 29 of the leasing act. As the placing of such a reservation in a lease is made discretionary with the Secretary, it necessarily follows that any disposition of the surface

of lands embraced in permits or leases is by the act left entirely discretionary with the Land Department, to be determined on the facts of each particular case.

The so-called relief sections of the act (18, 18 (*a*), 19, and 22) recognize equitable rights in the owners and occupants of claims initiated under the general mining laws and accord to them a preference right which may be exercised by applying within the time and in the manner prescribed by said sections for oil or gas leases or permits. These prior rights or claims, if asserted within the time accorded the claimants by the statute, are superior, both in time and right, to nonmineral applications or selections having their inception subsequent to the leasing act. It is apparent also that the allowance of nonmineral appropriation of the surface of vacant lands in producing structures will interfere with the leasing of such lands by competitive bidding under section 17 of the leasing act.

You are therefore directed:

LANDS OUTSIDE PRODUCING STRUCTURES

(1) In all cases of applications to make nonmineral entries or selections of lands *outside* of areas which have been designated by the department as within the geologic structures of producing oil or gas fields, and which lands are also embraced in applications for prospecting permits or in permits granted, such nonmineral applications should be received, noted on your records, suspended, and transmitted to the Commissioner of the General Land Office for instructions. If in any case such nonmineral entry or selection shall be allowed by you on instructions from the Commissioner, the same will be with a reservation of the oil or gas to the United States, and subject to the rights of the permittee or lessee, as the case may be, to use so much of the surface of such land as is necessary in extracting and removing the mineral deposits, without compensation to the nonmineral entryman for such use, in accordance with section 29 of the leasing act.

LANDS IN PRODUCING STRUCTURES

(2) You will reject all applications to enter, file upon, or select under the nonmineral land laws, lands which have been or shall be designated by the department as being *within* the known geologic structures of producing oil or gas fields, pending consideration by the department of the agricultural character and value of such lands and a determination as to whether the surface of the land is of agricultural character and value and may be disposed of without detriment to the public interest.

(3) All homestead entries or other nonmineral filings or selections *allowed* prior to receipt of these instructions and subsequent to February 24, 1920, which are found to be in conflict with preference rights timely asserted under the remedial provisions of the act of February 25, 1920, shall be suspended pending the consideration of the application for the permit or lease, and the parties in interest so advised. If the permit or lease be allowed or granted, such homestead entry or other allowed nonmineral application or selection will be canceled if the lands are within designated geologic structures of producing oil or gas fields. If outside of such designations, the agricultural entries, applications, or selections will be allowed to stand or will be canceled in the discretion of the department, as provided in section 1 hereof.

LIABILITY FOR DAMAGES

(4) Your attention is drawn to the distinction which exists under the law with respect to the rights of permittees and lessees of mineral deposits in cases where the nonmineral entry or selection is allowed subsequent to the application for permit or lease or subsequent to February 25, 1920, in conflict with rights recognized by sections 18, 18 (*a*), 19, and 22 of the leasing act, and those cases where the nonmineral entry, filing, or selection with a reservation of the mineral (either at time of entry or later) under the acts of July 17, 1914 (36 Stat., 509), or December 29, 1916 (39 Stat., 862), precedes the permit, lease, or mineral right, for in the latter case the nonmineral claimant is entitled to be reimbursed for all damages to crops and improvements by reason of the operations of the permittee or lessee, as provided in those acts, while in the former the respective rights of the mineral and surface claimants are governed by section 29 of the leasing act.

CLAY TALLMAN,
Commissioner.

Approved October 6, 1920.
JOHN BARTON PAYNE,
Secretary.

EXTRACTS FROM OFFICIAL CORRESPONDENCE OF THE DEPARTMENT OF THE INTERIOR

Land Designated as Oil Structure after Application for Permit. — The regulations concerning oil and gas permits and leases based upon rulings of the Secretary of the Interior, and approved October 29, 1920, originally stated, — "Where, after application under Section 13 for a permit, and before permit is granted, the land is designated as within the structure of a producing oil or gas field, permit cannot be allowed."

This regulation and the rulings on which it is based were not issued under a mandatory provision of the statute, Section 13 of the act of February 25, 1920, authorizing the Secretary of the Interior to grant to any qualified applicant a prospecting permit upon lands " wherein such deposits belong to the United States and are not within any known geological structure of a producing oil or gas field."

Rulings of this Department in cases involving a like situation, arising under other land laws, are to the contrary. In the case of Charles C. Conrad (39 L. D., 432), where a homestead application was filed, and where the entryman had performed all acts necessary to complete his application, but, by reason of delay in action thereupon by the local office, a first form withdrawal under the reclamation act intervened, the Department held that his rights could not be prejudiced by the inability of the local office to allow the application until after the withdrawal, but that they related back to the time when he filed in the local land office his application, accompanied by the required showing, including the fees, the land being then subject to his application.

This and similar rulings of the Department are approved in principle by the recent decisions of the Supreme Court of the United States in cases of Payne *vs.* Central Pacific Railway Company (February 28, 1921); Payne *vs.* New Mexico (March 7, 1921), and Wyoming *vs.* United States (March 28, 1921).

Applying the principle so announced, it is clear that, not only equitably but

legally, qualified persons who filed proper applications for oil or gas prospecting permits under the act of February 25, 1920, cannot and should not be deprived of their rights if, because of delay in action upon the applications so filed, there intervenes a designation by this Department of the lands as being within the geological structure of a producing oil or gas field, occasioned by a discovery of oil or gas subsequent to the filing of the application in the local land office. Accordingly, said regulation is hereby revoked, and in future applications will be adjudicated in accordance with the views herein expressed.

The statute, however, specifically forbids the allowance and approval of a prospecting permit upon lands within a " known geological structure of a producing oil or gas field " (Section 13); and in Section 17 provision is made for the disposition of unappropriated lands in such structures by competitive bidding. Therefore, nothing in this opinion shall be construed as modifying or affecting previous decisions of this Department to the effect that prospecting permits cannot be allowed within the geological structure of a producing oil or gas field, so known and existing at and prior to the filing of the application for the prospecting permit.

Limitation of Permits Under Section 19. — Section 19 of the act of February 25, 1920 (41 Stat., 437), gives to certain persons who had located or acquired placer mining claims and who are able to meet other requirements imposed in the law, a preference right to prospecting permits upon such locations " upon the same terms and conditions, and limitations as to acreage, as other permits provided for in this act."

The limitation as to acreage which may be included in a single permit is found in Section 13 — 2560 acres. There is no limitation in Section 19 as to the number of permits which may be obtained by a qualified person or persons who held the placer mining claims and are able to meet the conditions of the act.

As an administrative matter and in harmony with the evident intent of the act to avoid monopoly, a regulation was embodied in the oil and gas regulations of October 29, 1920, to the effect that qualified assignees since October 1, 1919, may secure preference-right permits, " but no such transferee will be permitted to hold permits exceeding 2560 acres for such lands in the same geological structure, nor more than three times that area in the same State."

While the intent of the act is to prevent monopoly, its primary purpose was to encourage prospecting for and development of the oil and gas resources of the United States. In localities remote from transportation, refineries, pipe lines, and sources of supply, it may be difficult to secure the exploration of a wildcat territory if the person or corporation conducting the exploration and development is limited to a maximum of 2560 acres. Moreover, as stated above, Section 19 is a remedial section, designed to take care of equitable claims of those who had initiated claim under the placer mining laws prior to withdrawals or prior to the repeal of the general mining laws as applicable to oil and gas deposits, and consequently no limitation was made in the statute as to the number of such locations which might be surrendered and made the basis of prospecting permits. The limitation above quoted is one of regulation and expediency and not of statute. Therefore, having in mind the purpose of the act and the scope of Section 19, it is held that for development purposes, assignments of prospecting permits secured under Section 19 of the act, to a qualified individual, corporation, or association outside producing oil and gas fields and in localities without transportation facilities, refineries, pipe lines, or nearby

sources of supply, for not exceeding five such permits in a State and near enough to each other for common development, whether contiguous or noncontiguous, may be presented for the consideration of the Secretary of the Interior, and his approval if he shall find same to be in the public interest.

To the extent of its conflict with the foregoing, said regulation under Section 19 of the act of February 25, 1920, is modified.

Bond with Application for Permit. — Paragraph 4 (*h*) of Circular No. 672, is hereby amended to read as follows:

> " The application must be accompanied by a bond with qualified corporate surety, in the sum of $1000, conditioned against the failure of the permittee to repair promptly, so far as possible, any damage to the oil strata or deposits resulting from improper methods of operation. The penalty of the bond may be increased by the Secretary of the Interior when conditions warrant, particularly in relief cases."

Application for Lease. — The regulations pertaining to and governing oil and gas permits and leases, pursuant to the Act of Congress of February 25, 1920 (41 Stats., 437), published as Circular No. 672, are hereby amended so as to incorporate therein a new paragraph, to be numbered Paragraph 8 (*a*), reading as follows:

> 8 (*a*). When an application for a lease of the one-fourth part of the area affected by a prospecting permit is submitted, supported by the requisite evidence of discovery and production of oil or gas, such application must be accompanied by further application by the permittee, or by an assignee of such permittee, for a lease of the remaining portion of the area described in the permit; or, in the alternative, a relinquishment of the permit and waiver of preference right in respect of such remaining area must be submitted.

STATE ACKNOWLEDGMENTS[1]

STATE OF ALABAMA,

County of.....

I,....., a Notary Public in and for said County, in state aforesaid, hereby certify that.....

.....

whose name.....signed to the foregoing conveyance, and who ..... known to me, acknowledged before me on this day, that, being informed on the contents of the conveyance,.....executed the same voluntarily on the day the same bears date.

Given under my hand, this the.....day of....., A. D., 192.....

.....

Notary Public..... County

STATE OF ARKANSAS,

Be it remembered, that on this day came before me, the undersigned,....., a notary public within and for the county aforesaid, duly commissioned and acting, ..., to me well known as the grantor (or lessor, etc.) in the foregoing lease, and stated that he had executed the same for the consideration and purposes therein mentioned and set forth.

Witness my hand and seal, as such notary public, on this,.....day of..... ....., 192.....

.....

STATE OF CALIFORNIA,

On this.....day of....., in the year ....., before me....., personally appeared A. B. known to me to be the person whose name is subscribed to the within instrument, and acknowledged to me that he (or they) executed the same.

.....

STATE OF ILLINOIS,

I,....., do hereby certify that..... (and..... his wife), personally known to me to be the same person whose name is subscribed to the foregoing instrument, appeared before me this day in person, and acknowledged that he (they) signed, sealed and delivered the said instrument as his (their) free and voluntary act, for the uses and purposes therein set forth.

Given under my hand and official seal, this.....day of....., A. D., 192.....

.....

[1] For reference, see Giauque, F., Notary's and Conveyancer's Manual.

STATE OF INDIANA,

Be it remembered, that on this.....day of.. ......, A. D. 192...., before me..... in and for said county, personally appeared....., the grantor....., in the foregoing deed, and acknowledged the execution of the same.

In witness whereof, I have hereunto set my hand and affixed my official seal, the day and year aforesaid.

.....

STATE OF KANSAS,
County of..... } ss.

BE IT REMEMBERED, That on this.....day of .....in the year of our Lord one thousand nine hundred and ....., before me, a Notary Public in and for said County and State, came.....and....., to me personally known to be the identical person.....who executed the above and foregoing instrument, and who each duly acknowledged the execution of the same.

In Witness Whereof, I have hereunto set my official signature and affixed my notarial seal the day and year first above written.

.....
Notary Public

My Commission expires.....

STATE OF KENTUCKY,
County of..... } ss.

I, ..., a..... do certify that the within and foregoing instrument of writing was this day produced to me in my County by.....and, ... his wife, and acknowledged by.....to be.....act and deed.

Given under my hand this.....day of....., 192.....

.....

.....

STATE OF LOUISIANA,
Parish of..... }

BEFORE ME,.....a Notary Public in and for.....Parish, Louisiana, on this.....day of.....192....., personally came and appeared..... ....., who in the presence of me, said authority, and.....and..... ..... competent witnesses, declares and acknowledges that .....he..... the identical person.....who executed the foregoing instrument in writing, that.....signature.....thereto.....own true and genuine signature....., and that.....he..... executed said instrument of.....own free will....., and for the purposes and considerations therein expressed.

Thus done and passed on the day and date hereinabove written, in the presence of the before-named and undersigned competent witnesses, who have hereunto sub-

scribed their names, together with said appearer....., and me, said Notary, after reading the whole.

WITNESSES: .....
....
....
.....
Notary Public

STATE OF MICHIGAN,

On this.....day of....., A. D., 192....., before me,....., personally came.....and ....., known to me to be the person (s) who executed the foregoing instrument, and acknowledged same as.....free act and deed.

.....

STATE OF MONTANA,

On this.....day of....., 192....., before me....., in and for said county personally appeared.....and....., personally known to me to be the person....described in, and who executed the foregoing instrument, and acknowledged that.....executed the same.

In witness whereof, I have hereunto subscribed my name and affixed my official seal the day and year in this certificate first above written.

.....

STATE OF OHIO,

On this.....day of....., A. D., 19....., before me, a.....in and for said county, personally came..... and....., the grantor.... in the foregoing lease, and acknowledged the signing thereof to be.....voluntary act.

Witness my official signature and seal, on the day last above mentioned.

.....

STATE OF OKLAHOMA, }
County of..... } ss.

BE IT REMEMBERED, That on this.....day of..... ....., in the year of our Lord, one thousand nine hundred and..... ....., before me, a Notary Public in and for said County and State, personally appeared.....and..... to me known to be the identical person....who executed the within and foregoing instrument and acknowledged to me that.....executed the same as.. .....free and voluntary act and deed for the uses and purposes therein set forth.

IN WITNESS WHEREOF, I have hereunto set my official signature and affixed my notarial seal the day and year first above written.

.....
Notary Public

My Commission expires.....

STATE OF PENNSYLVANIA, County of..... ss.

On this.....day of.....192.....before me, a.....in and for said County, personally appeared the above named..... ..... and acknowledged the within instrument to be.....act and deed, and desired the same to be recorded as such.

WITNESS my hand and.....seal the date of aforesaid.

.....(*Seal*)

THE STATE OF TEXAS,

County of..... BEFORE ME,..... .....in and for.....County, Texas, on this day personally appeared ..... known to me to be the person.....whose name.....subscribed to the foregoing instrument, and acknowledged to me that.....he..... executed the same for the purposes and consideration therein expressed.

GIVEN Under My Hand and Seal of Office, this.....day of..... .....A.D., 19.....

(L. S.) .....

Notary Public,.....County, Texas.

My Commission expires.....

STATE OF WYOMING,

I,..... ....., in and for said county, hereby certify that.....and....., personally known to me to be the person — whose names are subscribed to the foregoing instrument, appeared in person before me this day, and acknowledged that.....signed, sealed and delivered the said instrument as.....free and voluntary act, for the uses and purposes therein set forth.

Given under my hand, this.....day of....., A. D., 19.....

.....

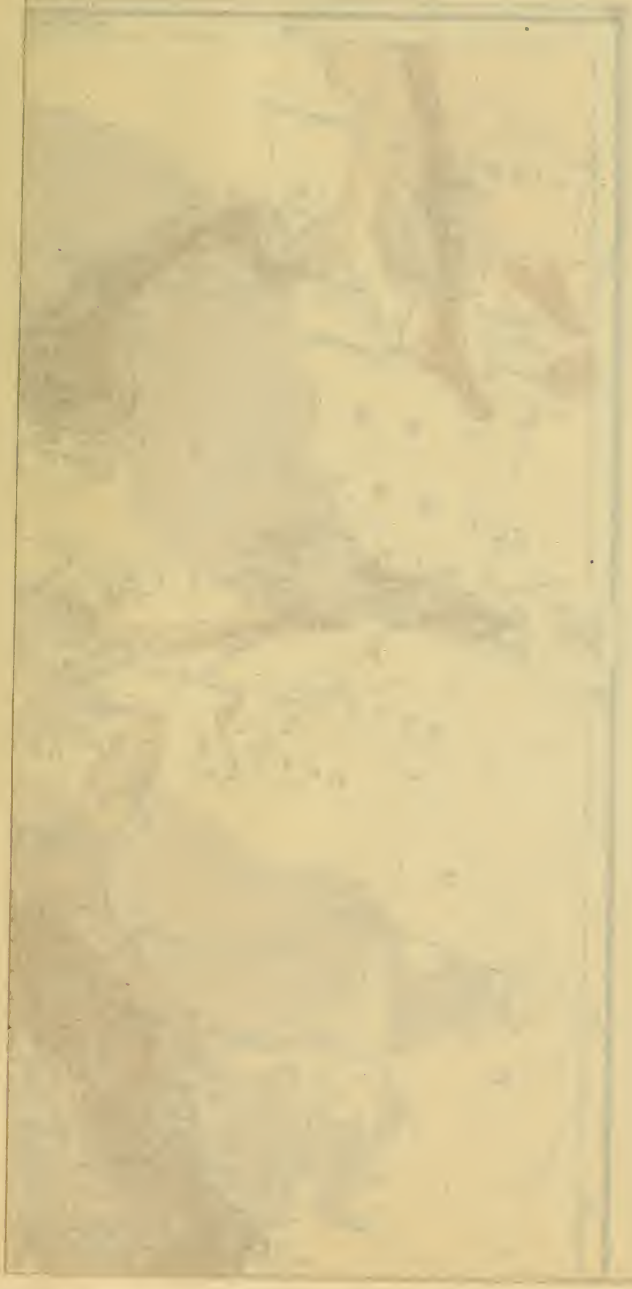
UNIFORM ACKNOWLEDGMENT

At the first meeting of the National Conference of Commissioners on Uniform State Laws, held at Saratoga, New York, August 24–27, 1892, the following Uniform Act Relative to Acknowledgment of Written Instruments was adopted, approved, and recommended to the various legislatures for enactment into law.

Section 1. — Either the form of acknowledgment now in use in this State, or the following:

On this.....day of....., 19....., before me personally appeared A. B. (or A. B. and C. D.), to me known to be the person (or persons) described in and who executed the foregoing instrument, and acknowledged that he (or they) executed the same as his (or their) free act and deed.[1]

[1] C. T. Terry, Uniform State Laws Annotated, 1920.




The most promising Areas for Oil Exploration
Less favorable Area for Oil Exploration
Relatively little Oil will be found
Practically no Oil will be found
Longitude West from Greenwich
FEDERATION OF CENTRAL AMERICA
GULF OF MEXICO
CARIBBEAN SEA
UNITED STATES
CANADA
GREENLAND
ICELAND
ALASKA
HUDSON BAY
BAFFIN BAY
ARCTIC OCEAN
PACIFIC OCEAN
ATLANTIC OCEAN
BAHAMA ISLANDS
JAMAICA
HONDURAS
NICARAGUA
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VENEZUELA

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